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☐ 1. Document ID: US 20030147091 A1

L5: Entry 1 of 70 File: PGPB Aug 7, 2003

DOCUMENT-IDENTIFIER: US 20030147091 A1
TITLE: Printing with reduced outline bleeding

Current US Classification, US Primary Class/Subclass:
358/1.13

Current US Classification, US Secondary Class/Subclass:
358/1.14

CLAIMS:

9. The method in accordance with claim 1, wherein the step(c) includes the step of selectively performing one of dot skipping and dot size reduction, to thereby adjust the dot data so as to reduce the amount of ink, the selection of the dot skipping and the dot size reduction depending on a pixel position of each dot within the specific image area.

18. The printing apparatus in accordance with claim 10, wherein the dot data adjuster is configured to selectively perform one of dot skipping and dot size reduction, to thereby adjust the dot data so as to reduce the amount of ink, the selection of the dot skipping and the dot size reduction depending on a pixel position of each dot within the specific image area.

27. The method in accordance with claim 19, wherein the step(c) includes the step of selectively performing one of dot skipping and dot size reduction, to thereby adjust the dot data so as to reduce the amount of ink, the selection of the dot skipping and the dot size reduction depending on a pixel position of each dot within the specific image area.

36. The printing control apparatus in accordance with claim 28, wherein the dot data adjuster is configured to selectively perform one of dot skipping and dot size reduction, to thereby adjust the dot data so as to reduce the amount of ink, the selection of the dot skipping and the dot size reduction depending on a pixel position of each dot within the specific image area.

45. The computer program product in accordance with claim 37, wherein the third program comprises a program for causing the computer to selectively perform one of dot skipping and dot size reduction, to thereby adjust the dot data so as to reduce the amount of ink, the selection of the dot skipping and the dot size reduction depending on a pixel position of each dot within the specific image area.

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☐ 2. Document ID: US 20030035146 A1

L5: Entry 2 of 70 File: PGPB Feb 20, 2003

DOCUMENT-IDENTIFIER: US 20030035146 A1
TITLE: Stochastic screening method with dot pattern regularity control and dot growth

Current US Classification, US Primary Class/Subclass:
358/3.14

Current US Classification, US Secondary Class/Subclass:
358/3.19

Current US Classification, US Secondary Class/Subclass:
358/3.26

Summary of Invention Paragraph:
[0003] Screening is a point processing operation. In screening, a two dimensional image (to be reproduced) is compared pixel-by-pixel with an image-independent threshold matrix. Screening methods may be classified into AM (amplitude modulated) screening, and FM (frequency modulated) screening. In AM screening, dot size (amplitude) is varied according to gray level. Dot size increases with gray level while the dot number is fixed. In contrast, a set of fixed-size, fine dots are used in FM screening whereby the dots are variably spaced from neighboring dots. When the gray level increases, the dot number (frequency) increases and therefore dot spacing is denser. Because the dot size of FM screening is smaller than the dot size of AM screening, an original image can be rendered with a higher resolution by FM screening.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 3. Document ID: US 20030002082 A1

L5: Entry 3 of 70 File: PGPB Jan 2, 2003

DOCUMENT-IDENTIFIER: US 20030002082 A1
TITLE: Image processing apparatus and its control method

Current US Classification, US Primary Class/Subclass:
358/3.03

Current US Classification, US Secondary Class/Subclass:
358/3.21

Current US Classification, US Secondary Class/Subclass:
358/3.22

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Current US Classification, US Secondary Class/Subclass:
358/534

Detail Description Paragraph:
[0065] Referring to FIG. 6, reference numeral 601 denotes a D/A converter for converting an input digital image signal into an analog image signal. Reference numeral 602 denotes a triangular wave generator for generating a triangular wave for one pixel period. Reference numeral 603 denotes a comparator for comparing the analog image signal output from the D/A converter 601 and the triangular wave selected by the triangular wave generator 602. Then, a pulse-width modulated (PWM) pulse signal is output. This pulse signal is sent to the laser driver (not shown). In this embodiment, since a binary signal is output, PWM halftone data is basically not used. However, halftone data may be output in place of a full-dot size so as to adjust a dot system upon outputting binary data.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 4. Document ID: US 20020171882 A1

L5: Entry 4 of 70 File: PGPB Nov 21, 2002

DOCUMENT-IDENTIFIER: US 20020171882 A1
TITLE: Image processing method

Current US Classification, US Primary Class/Subclass:
358/521

Summary of Invention Paragraph:
[0009] On the other hand, a dot to be practically printed has a shape different from rectangular one that is theoretically considered. For example, an eight-valued case for an ink jet printer is considered. As shown in FIG. 11, practical dots are reproduced using variable dot sizes of seven kinds for one pixel. In general, the size of each dot in each gradation is adjusted in advance to have a linear characteristic etc. in density. However, when pixels having fifth-gradations are printed successively, it is desirable that edges of the dots are secured as shown with H in FIG. 12. In a practical case, the adjacent dots are associated with each other as shown with I in FIG. 12. With the influence of the association, a dot area increases remarkably. That is, a surplus area d is generated owing to the association, and the density increases rapidly. A phenomenon such that a rapid change in density occurs in a case where the specific numbers of gradation are adjacent to each other is referred to as a tone jump. The phenomenon occurs not only in an ink jet printer but also in the other image forming apparatuses.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 5. Document ID: US 20020145758 A1

L5: Entry 5 of 70 File: PGPB Oct 10, 2002

DOCUMENT-IDENTIFIER: US 20020145758 A1

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TITLE: Error diffusion with partial dots method and system

Current US Classification, US Primary Class/Subclass:
358/3.03

Current US Classification, US Secondary Class/Subclass:
358/3.06

Detail Description Paragraph:
[0056] One aspect of the partial dot size error diffusion of the present invention is that as the gray level increases, the dot size (or density) increases, while the number of dots also increases. This result is achieved in an efficient manner and can be implemented in a cost-effective fashion.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 6. Document ID: US 20020136463 A1

L5: Entry 6 of 70 File: PGPB Sep 26, 2002

DOCUMENT-IDENTIFIER: US 20020136463 A1
TITLE: Image processing apparatus, image forming apparatus, and image processing method

Current US Classification, US Primary Class/Subclass:
382/260

Detail Description Paragraph:
[0059] A halftone preprocessing unit 4441 subjects image data to such processing that decreases a size of a dot within a halftone-dot area included in the image data so as to be smaller than a mesh of an isolated pixel detection filter that is described later, in accordance with the resolution of the image data. To be more specific, the halftone preprocessing unit 4441 subjects brightness (L) data S2 to a pixel culling process so as to decrease the number of pixels thereof. The construction of the halftone preprocessing unit 4441 and the like is not described here as it is well known, and is described in U.S. patent application Ser. No. 09/369,176, which is incorporated by reference. Due to this pixel culling process, even when the image data has high resolution such as 600 dpi, the size of a dot within a halftone-dot area can be decreased to a size detectable by the same isolated pixel filter used when the image data has resolution of 400 dpi.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 7. Document ID: US 20020135788 A1

L5: Entry 7 of 70 File: PGPB Sep 26, 2002

DOCUMENT-IDENTIFIER: US 20020135788 A1
TITLE: Image forming method and system

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Current US Classification, US Primary Class/Subclass:
358/1.1

Detail Description Paragraph:
[0682] While the foregoing example assumes the size of each pixel to be approximately equal to the size of one dot, gradation can also be achieved by controlling the timing of ink droplet jetting so as to define a pixel as a matrix of m.times.n dots and varying the distribution of dots in the matrix. Moreover, a still greater range of gradation levels can be obtained by using different combinations of matrix dot distributio nand the density. Since use of matrices reduces resolution relative to the earlier example by an amount proportional to matrix size, however, degradation of resolution is preferably prevented by reducing dot size and increasing dot density.

☐ 8. Document ID: US 20020126305 A1

L5: Entry 8 of 70 File: PGPB Sep 12, 2002

DOCUMENT-IDENTIFIER: US 20020126305 A1
TITLE: Image forming device fast draft print mode

Current US Classification, US Primary Class/Subclass:
358/1.13

Summary of Invention Paragraph:
[0011] U.S. Pat. No. 4,717,925 issued January, 1988 to SHIBATA ET AL. for an Optical Scanner Without Extra Convergent Lens teaches a scanner error correction device which is similar in concept to that described in U.S. Pat. No. 4,613,877 discussed above. Additionally, this patent teaches an adjustable intensity laser beam using a photodetector, cooperating driver controller and laser driver to continuously adjust the intensity of the beam. As the data video rate increases, the intensity of the beam is increased to provide a uniform spot or dot size regardless of the shortened duty cycle.

☐ 9. Document ID: US 20020075494 A1

L5: Entry 9 of 70 File: PGPB Jun 20, 2002

DOCUMENT-IDENTIFIER: US 20020075494 A1
TITLE: Image processing apparatus, method of image processing, print control apparatus, and recording media

Current US Classification, US Primary Class/Subclass:

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358/1.9

Current US Classification, US Secondary Class/Subclass:
358/3.03

Detail Description Paragraph:
[0224] For the clarity of explanation, any of the above embodiments and their modifications uses only one type of dots and allows selection only between the dot on state and the dot off state in each pixel. The technique of the present invention is applicable to the printer that is capable of creating different types of dots, for example, variable-sized dots or dots having different ink densities. In the printer that creates two variable-sized dots, that is, a large-sized dot and a small-sized dot, the procedure of the present invention may be modified to determine the dot on-off state in the following manner. Two threshold values th1 and th2 (where th1>th2) are set in advance. The procedure determines creation of a large-sized dot in a pixel when the correction data of the pixel is greater than the threshold value th1, determines creation of a small-sized dot when the correction data is smaller than the threshold value th1 but greater than the threshold value th2, and determines creation of no dot when the correction data is smaller than the threshold value th2. The tone error arising in each pixel is calculated by subtracting the resulting value from the correction data of the pixel.

☐ 10. Document ID: US 20020054305 A1

L5: Entry 10 of 70 File: PGPB May 9, 2002

DOCUMENT-IDENTIFIER: US 20020054305 A1
TITLE: Image processing method and apparatus

Current US Classification, US Primary Class/Subclass:
358/1.8

Current US Classification, US Secondary Class/Subclass:
358/1.9

Summary of Invention Paragraph:
[0014] To solve these problems, for example, Japanese Patent Application Laid-open No. 11-291506 describes a reduction of a number of nozzles used in the above described back end area, that is, a reduction of the printing width for the purpose of reducing the amount of sheet fed at one feeding operation, thus lessening a feeding error. This publication essentially discloses the invention of a printing method of increasing resolution on a basis of interlacing to restrain the back end area from being fed inaccurately. It describes not only the reduction of the feeding amount as described above but also an increase in a size of a dot for the purpose of making the feeding error unrecognized as well as performing printing of a raster, an array of pixels extending in a scanning direction, using two different nozzles.

Detail Description Paragraph:
[0270] For the first area, for example, a mask used for 4-pass bi-directional printing is generated by randomly arranging dot masses which have ratio of the width to the length is 2:1, in order to prevent uneven colors that may result from

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bi-directional printing. On the other hand, for the second area, a greater importance is attached to the elimination of stripes even if this results in slightly uneven colors. Then, as a variation of the masks shown in FIGS. 26A and 26B, a mask is provided such that the size of each of the dot masses is increased in the sub-scanning direction, for example, up to 2.times.4 and these masses are randomly shifted relative to the sub-scanning direction, that is, a random relationship is established between the locations of dots formed during the first and second passes, as shown in FIGS. 27A and 27B. This effectively reduces stripes that may result from the deviation of the dot formed locations in the sub-scanning direction.

Detail Description Paragraph:
[0272] As another variation, a mask is provided such that the size of each of the dot masses is increased in the main-scanning direction, for example, up to 4.times.1 and these masses are randomly shifted relative to the main-scanning direction, as shown in FIGS. 28A and 28B. This effectively reduces stripes that may result from the deviation of the dot forming locations in the main-scanning direction.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw De

☐ 11. Document ID: US 20020036803 A1

L5: Entry 11 of 70 File: PGPB Mar 28, 2002

DOCUMENT-IDENTIFIER: US 20020036803 A1
TITLE: Method and apparatus for compensating for dot gain in stochastic printing

Abstract Paragraph:
A method for compensating for dot gain in printing with stochastic screens comprises obtaining continuous tone CMYK files and screening the files at a resolution that is lower than the resolution of an output device that will be used to print the files. The lower resolution stochastically screened files are then expanded to the resolution of the output device, thereby effectively increasing the size of the dots by creating a number of subdots for each dot in the lower resolution stochastically screened files. Subdots within the expanded stochastically screened files can then be selectively removed to compensate for dot gain. In addition, overlapping dots in the screened CMYK files are removed and additional stochastically screened files are created that print a dot of a color of the previously overlapping dots and at the location of the previously overlapping dots to prevent colors from running together when printing on certain media. Finally, the removal of subdots in the expanded CMYK files can be performed to correct the color of the images when the expanded stochastically screened file is printed.

Current US Classification, US Primary Class/Subclass:
358/3.19

Current US Classification, US Secondary Class/Subclass:
358/1.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw De

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☐ 12. Document ID: US 6543870 B1

L5: Entry 12 of 70 File: USPT Apr 8, 2003

DOCUMENT-IDENTIFIER: US 6543870 B1
TITLE: Image processing apparatus and printing apparatus

Detailed Description Text (39):
The weight of ink ejected is varied according to the rate of change in the decrease of the potential of the piezoelectric element PE (see the divisions d1 and d2), that is, according to the driving waveform applied to drive the respective nozzles. FIG. 12 shows driving waveforms used in the second embodiment. The procedure of the second embodiment provides two different driving waveforms, that is, a driving waveform W1 for creating small-sized dots and a driving waveform W2 for creating medium-sized dots. The driving waveforms W1 and W2 are output at a specific interval that allows the respective dots to be created in each pixel with the movement of the carriage 31. The greater weight of ink generally results in the higher jet speed of the ink droplet. In the printer PRT, the jet speeds of the respective ink droplets are adjusted to cause the small-sized dot and the medium-sized dot to hit against a substantially identical position on the printing paper P. Ejection of ink droplets in response to both the driving waveforms W1 and W2 completes a large-sized dot.

Current US Cross Reference Classification (2):
358/534

☐ 13. Document ID: US 6507666 B1

L5: Entry 13 of 70 File: USPT Jan 14, 2003

DOCUMENT-IDENTIFIER: US 6507666 B1
TITLE: Method and apparatus for compensating for dot gain in stochastic printing

Abstract Text (1):
A method of compensating for dot gain in printing with stochastic screens comprises obtaining continuous tone CMYK files and screening the files at a resolution that is lower than the resolution of an output device that will be used to print the files. The lower resolution stochasticly screened files are then expanded to the resolution of the output device, thereby effectively increasing the size of the dots by creating a number of subdots for each dot in the lower resolution stochasticly screened files. Subdots within the expanded stochasticly screened files can then be selectively removed to compensate for dot gain. In addition, overlapping dots in the screened CMYK files are removed and additional stochasticly screened files are created that print a dot of a color of the previously overlapping dots and at the location of the previously overlapping dots to prevent colors from running together when printing on certain media. Finally, the removal of subdots in the expanded CMYK files can be performed to correct the color of the images when the expanded stochasticly screened file is printed.

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Current US Original Classification (1):
382/167

Current US Cross Reference Classification (1):
358/518

Current US Cross Reference Classification (2):
358/528

Current US Cross Reference Classification (3):
358/534

Current US Cross Reference Classification (4):
358/536

Current US Cross Reference Classification (5):
358/537

Current US Cross Reference Classification (6):
382/162

Current US Cross Reference Classification (7):
382/163

Current US Cross Reference Classification (8):
382/254

Current US Cross Reference Classification (9):
382/275

Current US Cross Reference Classification (10):
382/298

Current US Cross Reference Classification (11):
382/299

☐ 14. Document ID: US 6433891 B1

L5: Entry 14 of 70 File: USPT Aug 13, 2002

DOCUMENT-IDENTIFIER: US 6433891 B1
TITLE: Stochastic screening method with dot pattern regularity control and dot growth

Brief Summary Text (4):
Screening is a point processing operation. In screening, a two dimensional image (to be reproduced) is compared pixel-by-pixel with an image-independent threshold matrix. Screening methods may be classified into AM (amplitude modulated) screening, and FM (frequency modulated) screening. In AM screening, dot size (amplitude) is varied according to gray level. Dot size increases with gray level while the dot number is fixed. In contrast, a set of fixed-size, fine dots are used in FM screening whereby the dots are variably spaced from neighboring dots. When the gray level increases, the dot number (frequency) increases and therefore dot

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spacing is denser. Because the dot size of FM screening is smaller than the dot size of AM screening, an original image can be rendered with a higher resolution by FM screening.

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (1):
382/237

☐ 15. Document ID: US 6356360 B1

L5: Entry 15 of 70 File: USPT Mar 12, 2002

DOCUMENT-IDENTIFIER: US 6356360 B1
TITLE: Apparatus and method for rendering halftone dot structures using grey level dots

Detailed Description Text (6):
With reference now to FIG. 4 there is shown a halftone dot density growth pattern for halftone cells provided according to the inventions. As noted above where the bit depth, i.e. number of bits used to define the grey level of a pixel, is relatively low there is limited ability to define better quality pictorial information. The use of the halftone cell dot structure improves the ability to represent variations in grey level but to obtain further increases in grey level typically this will require lower resolution as cell dot size increases.

Current US Original Classification (1):
358/1.9

☐ 16. Document ID: US 6331901 B1

L5: Entry 16 of 70 File: USPT Dec 18, 2001

DOCUMENT-IDENTIFIER: US 6331901 B1
TITLE: Coded data output apparatus

Detailed Description Text (47):
Ideally, data are taken in with the smallest possible number of pixels without error when the CCD sampling is conducted with the dot size of a half of the dot interval. However, the size will have to be made smaller in most cases because the CCD sampling becomes short of number if the size is greater than a half of the dot interval but the problem of a reduced allowable amount of data arises as will be described hereinafter if the CCD pixel aperture is reduced (in relative terms, although the CCD pixels do not vary and therefore the dot size increases if the CCD

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pixels are unvaried). In other words, it is advantageous to use a relatively small dot size. The CCD sample interval has a limit of a half of the dot size, provided that data can be taken in with the smallest possible number of pixels.

Current US Original Classification (1):
358/1.2

Current US Cross Reference Classification (2):
358/3.26

Current US Cross Reference Classification (3):
358/3.29

Current US Cross Reference Classification (4):
382/237

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

☐ 17. Document ID: US 6328404 B1

L5: Entry 17 of 70 File: USPT Dec 11, 2001

DOCUMENT-IDENTIFIER: US 6328404 B1
TITLE: Printing apparatus, printer included in printing apparatus, and method of printing

Detailed Description Text (42):
When the correction data CDX is less than the predetermined third threshold value TH2, the program determines that no dot is to be created in the pixel of interest and sets a value `0` representing `creation of no dots` to the resulting value RD of the multilevel process at step S245. This procedure allocates one of the four levels or tones, that is, `creation of no dots`, `creation of the small dot`, `creation of the medium dot`, and `creation of the large dot`, to each pixel. The above processing with a greater number of threshold values may be carried out when the greater-level processing is required with an increase in number of variable-size dots possibly created in the respective pixels.

Current US Cross Reference Classification (2):
358/1.2

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

☑ 18. Document ID: US 6310698 B1

L5: Entry 18 of 70 File: USPT Oct 30, 2001

DOCUMENT-IDENTIFIER: US 6310698 B1
TITLE: Process for calibrating electronic imaging devices

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Brief Summary Text (15):
Calibration methods have been developed to compensate for the effects of these different factors on the final image dots so that the gray levels produced on the output media is equal to the gray levels requested by the computer workstation. As currently practiced, these methods typically require direct measurement of a multitude of output test areas containing different size dots, generated during calibration procedures in which a series of gray values are requested as original input for each of every halftone grid screens used and for each of the different output media used. The data obtained from these measurements are typically preserved in a computer memory as a look up table (LUT) or curves in hard copy format in the form of output dot size as a function of requested, or input dot size. From these values or curves one may work backward to obtain correction values or curves that can be applied to the requested dot sizes before such values are used by the image setter, to modify such dot sizes so that the output dot sizes accurately represent the requested sizes. Hereinafter, the obtained correction values, whether stored as LUT or curves are both referred to as "calibration curves".

Current US Original Classification (1):
358/3.12

Current US Cross Reference Classification (1):
358/406

☐ 19. Document ID: US 6297890 B1

L5: Entry 19 of 70 File: USPT Oct 2, 2001

DOCUMENT-IDENTIFIER: US 6297890 B1
TITLE: Coded data output apparatus

Detailed Description Text (48):
Ideally, data are taken in with the smallest possible number of pixels without error when the CCD sampling is conducted with the dot size of a half of the dot interval. However, the size will have to be made smaller in most cases because the CCD sampling becomes short of number if the size is greater than a half of the dot interval but the problem of a reduced allowable amount of data arises as will be described hereinafter if the CCD pixel aperture is reduced (in relative terms, although the CCD pixels do not vary and therefore the dot size increases if the CCD pixels are unvaried). In other words, it is advantageous to use a relatively small dot size. The CCD sample interval has a limit of a half of the dot size, provided that data can be taken in with the smallest possible number of pixels.

Current US Original Classification (1):
358/1.9

☐ 20. Document ID: US 6219154 B1

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L5: Entry 20 of 70 File: USPT Apr 17, 2001

DOCUMENT-IDENTIFIER: US 6219154 B1
TITLE: Exposure control technique for imagesetting applications

Brief Summary Text (25):
The control wedge also provides a tool for visually determining the degree to which the actual exposure setting of the platesetting or imagesetting system used in producing the wedge differs from the optimum exposure. More particularly, the location of the most sensitive patch having a tint matching that of the least sensitive patch will provide a relatively precise indicator of the degree error in the system exposure setting. For example, if the patch beginning the row is a checkerboard having a 1 pixel dot size and each successive patch in the row has a 1.times.1 pixel increase in dot size, should the tints of the least sensitive patch, e.g. an 8.times.8 pixel patch, match with those patches having a dot size from 3.times.3 through 7.times.7 pixels, the operator will know that the exposure is acceptable down to a 3.times.3 pixel dot size and can therefore gauge whether or not the exposure setting is satisfactory for the intended production recording.

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (3):
358/406

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWMC | Draw De

☐ 21. Document ID: US 6211970 B1

L5: Entry 21 of 70 File: USPT Apr 3, 2001

DOCUMENT-IDENTIFIER: US 6211970 B1
TITLE: Binary printer with halftone printing temperature correction

Detailed Description Text (13):
At this juncture, it is noted that this kind of binary halftone printing is popular because it allows generation of a multitude of colors by merely printing or not printing dots of the primary colors at each pixel location. Dot size does not need to be adjusted, which allows a simpler print head design because ink flow does not need to be mechanically adjusted to effect different droplet (and consequent dot) sizes.

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (4):
358/1.8

Current US Cross Reference Classification (5):
358/502

Current US Cross Reference Classification (6):

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Record List Display

358/521

Current US Cross Reference Classification (7):
358/534

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 22. Document ID: US 6188806 B1

L5: Entry 22 of 70 File: USPT Feb 13, 2001

DOCUMENT-IDENTIFIER: US 6188806 B1
TITLE: Apparatus for reading optical data from a motion picture film and a light source therefor

Detailed Description Text (19):
The above-described film block may be symmetrically recorded in the right channel digital sound track 5R and the left channel digital sound track 5L of the motion picture film of the present invention. As shown in FIG. 9, the tracking patterns 53a and 53b of the left channel digital sound track 5L are recorded adjacent to the left edge 1L of the film 1, while the tracking patterns 53a' and 53b' of the right channel digital sound track 5R are recorded adjacent to the right edge 1R of the film 1. During reproduction, the left channel digital sound track 5L is read from the left edge 1L of the film 1, while the right channel digital sound track 5R is read from the right edge 1R of the film The audio data recorded on the motion picture film 1 has a predetermined size. More specifically, an audio data dot may have a size of 26.4.mu..times.24.1.mu. as, for example, shown in FIG. 5. The relationship between the dot size and the parity may be as shown in FIG. 6, wherein it is observed that as the dot size increases, the error rate becomes improved, and when the dot size is reduced, more parity data is appended or added. As further shown in FIG. 6, the error correction capability may be represented by a quadratic curve with the transverse dot size of 24.1.mu. as an apex. As a result, since the present invention records audio data dots having a size of 26.4.mu..times.24.1.mu., which size corresponds to the maximum error correcting capability, accurate reproduction of the audio data is facilitated.

Detailed Description Text (28):
The audio data recorded on the motion picture film 1 has a predetermined size. More specifically, an audio data dot may have a size of 26.4.mu..times.24.1.mu. as, for example, shown in FIG. 5. The relationship between the dot size and the parity may be as shown in FIG. 6, wherein it is observed that as the dot size increases, the error rate becomes improved, and when the dot size is reduced, more parity data is appended or added. As further shown in FIG. 5, the error correction capability may be represented by a quadratic curve with the transverse dot size of 24.1.mu. as an apex. As a result, since the present invention records audio data dots having a size of 26.4.mu..times.24.1.mu., which size corresponds to the maximum error correcting capability, accurate reproduction of the audio data is facilitated.

Current US Original Classification (1):
382/312

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 23. Document ID: US 6183933 B1

L5: Entry 23 of 70 File: USPT Feb 6, 2001

DOCUMENT-IDENTIFIER: US 6183933 B1
TITLE: Image forming method and system

Detailed Description Text (494):
While the foregoing example assumes the size of each pixel to be approximately equal to the size of one dot, gradation can also be achieved by controlling the timing of ink droplet jetting so as to define a pixel as a matrix of m.times.n dots and varying the distribution of dots in the matrix. Moreover, a still greater range of gradation levels can be obtained by using different combinations of matrix dot distribution and the density. Since use of matrices reduces resolution relative to the earlier example by an amount proportional to matrix size, however, degradation of resolution is preferably prevented by reducing dot size and increasing dot density.

Current US Cross Reference Classification (1):
358/474

Current US Cross Reference Classification (2):
358/480

☐ 24. Document ID: US 6170930 B1

L5: Entry 24 of 70 File: USPT Jan 9, 2001

DOCUMENT-IDENTIFIER: US 6170930 B1
TITLE: Method for producing gradient tonal representation and a printhead for producing the same

Current US Cross Reference Classification (1):
358/3.14

CLAIMS:

1. A method of producing a gradient tonal representation of an image on a physical medium using ink dot printing, comprising the steps of:

printing representations of image areas having intensities within a first, continuously variable, defined intensity level range by forming at respective dot locations, ink dots each having an intensity level that is selectively and continuously variable over a range representing said first defined intensity level range, by adjusting individual ink dot sizes over a continuous range of dot sizes d1 to d2;

printing representations of image areas having intensities within a second, continuously variable, defined intensity level range by forming at respective dot

locations, ink dots each having an intensity level that is selectively and continuously variable over a range representing said second defined intensity level range, by adjusting individual ink dot sizes over a continuous range of dot sizes d3 to d4; and

printing representations of image areas having intensities within a third, discretely variable intensity level range intermediate the first and second intensity level ranges by forming at respective dot locations, ink dots each having a size selected from a predetermined number of discrete size values that are either not greater than d1 or not less than d3;

wherein, in sequence, said first, third, and second intensity level ranges represent image areas of increasing intensity levels and the dot sizes increase from d1 to d2 to d3 to d4.

16. A method of producing a gradient tonal representation of an image on a physical medium using ink dot printing, comprising the steps of:

printing continuous tone representations of image areas having intensities within a first defined intensity level range by forming at respective dot locations, ink dots each having an intensity level that is selectively and continuously variable over a range representing said first defined intensity level range, by adjusting individual dot sizes within a continuous range d1 to d2 and at each dot location forming a defined plurality of dots;

printing continuous tone representations of image areas having intensities within a second defined intensity level range by forming at respective dot locations, ink dots each having an intensity level that is selectively and continuously variable over a range representing said second defined intensity level range, by adjusting individual dot sizes within a continuous range d3 to d4 and forming at each dot location a number of dots less than said defined plurality of dots;

printing non-continuous tone representations of image areas having intensities within a third intensity level range intermediate the first and second intensity level ranges by forming at respective dot locations, ink level ranges by forming at respective dot locations, ink dots each having a size selected from a predetermined number of discrete size values that are either not greater than d1 or not less than d3;

wherein, in sequence, said first, third and second intensity level ranges represent image areas of increasing intensity levels and the dot size images increase from d1to d2 to d3 to d4.

☐ 25. Document ID: US 6161919 A

L5: Entry 25 of 70 File: USPT Dec 19, 2000

DOCUMENT-IDENTIFIER: US 6161919 A
TITLE: Ink coverage reduction method for printers capable of printing multiple drop sizes

Record List Display

Detailed Description Text (8):
The next step is restriction block 14. Here, the respective pixel values and pixel print data sizes (if specified in the input bitmap) of the different color separations are either passed unchanged, if no color reduction is needed, or the dot sizes are decreased, if color reduction is needed. Thus, if the number of dots needed, v, is less than or equal to one, then the bitmap values B N (x,y) can be transferred directly to the image bitmap by setting I N (x,y,1) to ON and I N (x,y,2) to the desired dot size. If the input bitmap already specifies a desired print dot size, and if v is less than or equal to one, then the originally specified dot size is passed unchanged from the input bitmap to the image bitmap by setting I N (x,y,2) to the input bitmap dot size. However, if the number of dots needed, v, is greater than one, indicating that color reduction is needed, the bitmap values B N (x,y) must be changed. Here, each of the respective image bitmap color separation pixels will still be indicated as ON, i.e., by setting I N (x,y,1) to ON. However, the dot sizes of one or more of the pixels will be reduced so as not to use the largest size dots for all of the needed dots. However, if the input bitmap already specifies a desired print dot size, and if v is greater than one, then the originally specified dot size is overridden by the restriction block 14, and the dot size from the input bitmap is reduced from the input bitmap to the image bitmap by setting I N (x,y,2) to the desired smaller dot size. Thus, if a bit value of 1 indicates a large size dot and a bit value of 0 indicates a small size dot, one or more of the respective pixel size bits I N (x,y,2) will be set to 0 rather than to 1. Thus, this operation ensures that where two or more dots are to be printed at a single pixel, not all of the dots will be printed as the largest available dot size.

Current US Cross Reference Classification (2):
358/1.9

☐ 26. Document ID: US 6141121 A

L5: Entry 26 of 70 File: USPT Oct 31, 2000

DOCUMENT-IDENTIFIER: US 6141121 A
TITLE: Method and apparatus for color halftoning

Detailed Description Text (5):
Characteristics of cluster dots include halftone screen frequency, screen angle, halftone dot shape and the growth of the halftone dot size with increasing tonal value. All of these parameters influence the appearance of a printed halftone. Minor variations or inaccuracies can easily become visible as defects in the image.

Current US Original Classification (1):
358/534

Current US Cross Reference Classification (1):
358/1.9

Current US Cross Reference Classification (2):
358/536

Record List Display

Full | Title | Citation | Front | Review | Classification | Date | Reference | ... | Claims | KWIC | Draw De

☐ 27. Document ID: US 6122407 A

L5: Entry 27 of 70 File: USPT Sep 19, 2000

DOCUMENT-IDENTIFIER: US 6122407 A
TITLE: Method and apparatus for producing threshold arrays using variance minimization and sparse image calculations

Brief Summary Text (7):
There are two classes of ordered dither halftoning techniques known in the art. They are clustered-dot and dispersed-dot ordered dithering. Clustered-dot ordered dithering uses variable-size halftone dots at a fixed spacing. The addition of device pixels at a dot's outer edge increases the covered area and the size of the dot. When viewed from a distance, the larger the dot size, the greater the area covered and the darker the image area. Dispersed-dot ordered dithering is preferred when the display device is capable of displaying an isolated black or white pixel. It uses a fixed-size, smaller dot at variable spacing to achieve the same effect as clustered-dot ordered dithering. Variation in dot spacing varies the number of dots in a given area, or dot frequency. In such technique, a denser dot distribution provides a darker image area. On some display devices, each dot comprises up to four or five device pixels. Dispersed-dot ordering provides a dot distribution based upon the shade variations in the original image. The dot distribution is optimized to be the best representation possible for the particular display device.

Current US Original Classification (1):
382/270

Current US Cross Reference Classification (1):
358/3.2

Current US Cross Reference Classification (2):
382/272

Full | Title | Citation | Front | Review | Classification | Date | Reference | ... | Claims | KWIC | Draw De

☐ 28. Document ID: US 6116507 A

L5: Entry 28 of 70 File: USPT Sep 12, 2000

DOCUMENT-IDENTIFIER: US 6116507 A
TITLE: Information reproduction system for reproducing multimedia information recorded in the form of an optically readable dot code pattern wherein the optical readable dot code comprises address dots

Detailed Description Text (252):
As described above, the mask 144 is applied with reference to the position of a detected dot to detect the offset of the dot within the mask. After the mask 144 is

h e b b g e e e f e ef b e

Record List Display

moved in a direction to eliminate the offset, the center of the dot is calculated. That is, by determining a mask position with two paths, the mask size can be decreased in accordance with the dot size. Therefore, a memory having a small capacity can be used, and a reduction in error due to noise can be attained.

Detailed Description Text (463):
According to this arrangement, a mask is used, with reference to a position where a dot is detected, to detect the offset of a dot within the mask, and the mask is moved in a direction to eliminate the offset. Thereafter, the center is calculated. With this operation, the mask size can be decreased in accordance with the dot size, thereby allowing the use of a memory having a small capacity and reducing errors caused by noise.

Current US Cross Reference Classification (4):
382/190

Current US Cross Reference Classification (5):
382/199

☐ 29. Document ID: US 6081653 A

L5: Entry 29 of 70 File: USPT Jun 27, 2000

DOCUMENT-IDENTIFIER: US 6081653 A
TITLE: Color imaging

Brief Summary Text (12):
Another technique for "grey scaling" is referred to as "screening," wherein the level of enhancement (darkness, brightness or color) of a pel is determined by the number of adjacently disposed small dots which are formed at the pel location. Thus, a lightly enhanced pel may be formed of one or two adjacently disposed small dots, while a highly enhanced pel may be formed of, for example, nine adjacently disposed small dots. According to further grey scaling techniques, the level of enhancement of a pel is controlled by adjusting the size of the dot formed at the pel location.

Detailed Description Text (54):
In further preferred embodiments, one or more channels may be weighted greater than the others to emphasize that channel in the resulting image. Further clarity, sharpness and continuity may be accomplished by adjusting, e.g., the weight factors employed in the selected kernel. In the bi-level printing embodiment, the threshold value for one or all channels, to accommodate, for example, the dot size or dot spacing limitations of the printer or other image forming device being used. As an example, a preferred embodiment may employ a printer which produces a dot size of about 3.4 mils and a dot spacing of about 180 DPI (dots per inch). In the multi-level printing embodiment, threshold locations and the resulting correlation bins may be adjusted to accommodate similar dot size or spacing limitations.

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (1):
382/252

Record List Display

Full | Title | Citation | Front | Review | Classification | Date | Reference | ... | Claims | KWIC | Draw De

☐ 30. Document ID: US 6028972 A

L5: Entry 30 of 70 File: USPT Feb 22, 2000

DOCUMENT-IDENTIFIER: US 6028972 A
** See image for Certificate of Correction **
TITLE: Apparatus for reading optical data from a motion picture film and a light source therefor

Detailed Description Text (20):
The audio data recorded on the motion picture film 1 has a predetermined size. More specifically, an audio data dot may have a size of 26.4.mu..times.24.1.mu.to as, for example, shown in FIG. 5. The relationship between the dot size and the parity may be as shown in FIG. 6, wherein it is observed that as the dot size increases, the error rate becomes improved, and when the dot size is reduced, more parity data is appended or added. As further shown in FIG. 6, the error correction capability may be represented by a quadratic curve with the transverse dot size of 24.1.mu. as an apex. As a result, since the present invention records audio data dots having a size of 26.4.mu..times.24.1.mu., which size corresponds to the maximum error correcting capability, accurate reproduction of the audio data is facilitated.

Detailed Description Text (29):
The audio data recorded on the motion picture film 1 has a predetermined size. More specifically, an audio data dot may have a size of 26.4.mu..times.24.1 .mu. as, for example, shown in FIG. 5. The relationship between the dot size and the parity may be as shown in FIG. 6, wherein it is observed that as the dot size increases, the error rate becomes improved, and when the dot size is reduced, more parity data is appended or added. As further shown in FIG. 5, the error correction capability may be represented by a quadratic curve with the transverse dot size of 24.1.mu. as an apex. As a result, since the present invention records audio data dots having a size of 26.4.mu..times.24.1.mu., which size corresponds to the maximum error correcting capability, accurate reproduction of the audio data is facilitated.

Current US Original Classification (1):
382/312

Full | Title | Citation | Front | Review | Classification | Date | Reference | ... | Claims | KWIC | Draw De

☐ 31. Document ID: US 6014501 A

L5: Entry 31 of 70 File: USPT Jan 11, 2000

DOCUMENT-IDENTIFIER: US 6014501 A
TITLE: Coded data output apparatus

Detailed Description Text (47):

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Record List Display

Ideally, data are taken in with the smallest possible number of pixels without error when the CCD sampling is conducted with the dot size of a half of the dot interval. However, the size will have to be made smaller in most cases because the CCD sampling becomes short of number if the size is greater than a half of the dot interval but the problem of a reduced allowable amount of data arises as will be described hereinafter if the CCD pixel aperture is reduced (in relative terms, although the CCD pixels do not vary and therefore the dot size increases if the CCD pixels are unvaried). In other words, it is advantageous to use a relatively small dot size. The CCD sample interval has a limit of a half of the dot size, provided that data can be taken in with the smallest possible number of pixels.

Current US Original Classification (1):
358/3.09

Current US Cross Reference Classification (2):
358/1.18

Current US Cross Reference Classification (3):
358/1.9

Current US Cross Reference Classification (4):
358/3.3

Current US Cross Reference Classification (5):
358/465

Current US Cross Reference Classification (6):
358/471

☐ 32. Document ID: US 5975673 A

L5: Entry 32 of 70 File: USPT Nov 2, 1999

DOCUMENT-IDENTIFIER: US 5975673 A
** See image for Certificate of Correction **
TITLE: Image output method and apparatus for smoothing image data by manipulating dot sizes

Abstract Text (1):
According to an image processing method and apparatus of the present invention, an outline portion is extracted from input image data, and a pixel whose dot size is to be changed is extracted. The input image data is printed without any change, and the pixel whose dot size is to be changed is overlap-printed while the dot size is increased. Therefore, smoothing can be sufficiently performed in both the main scanning direction and the sub-scanning direction without increasing the dot density and decreasing the recording speed.

Current US Cross Reference Classification (1):
358/453

☐ 33. Document ID: US 5917614 A

L5: Entry 33 of 70 File: USPT Jun 29, 1999

DOCUMENT-IDENTIFIER: US 5917614 A
TITLE: Method and apparatus for error diffusion screening of images with improved smoothness in highlight and shadow regions

Brief Summary Text (12):
Error diffusion screening does not produce the traditional dot pattern of halftone screens. In a traditional halftone screen, the halftone dots have a fixed periodic dot frequency (screen ruling) for all grayshade values. In an error diffusion system, the halftone dots do not have a fixed periodic frequency. In some error diffusion systems, grayshades are formed with very small dots which are too fine to be well reproduced by most marking or reproduction devices. In U.S. Pat. 5,055,942 to the present inventor, an error diffusion technique is disclosed in which the coarseness of the halftone is controllable by adjustment of a hysteresis constant. Dot size, and therefore the dot frequency is adjustable, resulting in halftones having somewhat different size dots within a range of different periodic dot frequencies.

Current US Original Classification (1):
358/3.03

☐ 34. Document ID: US 5828463 A

L5: Entry 34 of 70 File: USPT Oct 27, 1998

DOCUMENT-IDENTIFIER: US 5828463 A
TITLE: Printing plate for a halftone image having toner dependent rosette structures BV phase modulation

Detailed Description Text (19):
In order to get a screen according to the current invention, the shift is made along or parallel to an internal diagonal. As in the example above, the (-1,-1) diagonal can be chosen. While the halftone dot is growing, the center shifts from (0,0) to (-1,-1). To obtain a screen according to the current invention one selects additional micro dots which are connected to the existing halftone dot to increase the halftone dot size. The maximum length of the shift from (0,0) to (-1,-1) is 2.sup.1/2. For a recording system capable of rendering images with a density precision of eight bits, a cell can be thought to consist of 256 micro dots arranged in sixteen lines and sixteen columns. The maximum shift of 2.sup.1/2 expressed in micro dots would be 16/2.sup.1/2 =11.31. A linear shift comprises a shift of this maximum distributed over 256 pixels and hence represents a distance of 11.31/256=0.044 micro dots for each grey level.

Current US Original Classification (1):
358/3.17

e b b g e e e f e ef b e

Record List Display

Current US Cross Reference Classification (1):
358/296

Current US Cross Reference Classification (2):
358/3.26

Current US Cross Reference Classification (3):
358/3.3

Current US Cross Reference Classification (4):
358/530

Current US Cross Reference Classification (5):
358/533

Current US Cross Reference Classification (6):
358/536

☑ 35. Document ID: US 5809216 A

L5: Entry 35 of 70 File: USPT Sep 15, 1998

DOCUMENT-IDENTIFIER: US 5809216 A
TITLE: Method and apparatus for multiple address recording with brightness and exposure time control

Detailed Description Text (39):
While data output from the framestore is described as related to density or size of a dot it may also reflect as is known in the art a signal related to percentage of coverage. The first LUT need not be a gamma LUT as it may modify an input signal related to density or size or percentage of coverage by a pixel with a characteristic(s) of the print system. For example, in an ink jet system the parameter might be the type of paper the drops are printed on since different paper types can provide differences in resulting image. In electrophotographic systems changes in humidity which are typical of seasonal changes in the environment affect charge to mass ratios which can be corrected for by use of different gamma correction tables in accordance with humidity. Thus, broadly, it will be seen that the first LUT takes a data input value related to density or size of dot or percentage of coverage and modifies the data input value in accordance with characteristics of the print system to provide a modified data value for input into the process LUT. The process LUT then in response to the modified data value in conjunction with a value related to a characteristic of the printhead or recording element outputs an output signal to the printhead to create a dot or pixel of appropriate density, size or percentage of coverage. Such output signal may determine an exposure or exposure parameter where the system relies on light or other radiation such as heat (thermal systems) for forming images or it could be frequencies of pulses sent to a piezoelectric ink-jet device, or number of drops to other ink-jet devices.

Current US Original Classification (1):
358/1.9

h e b b g e e e f e ef b e

Record List Display

Current US Cross Reference Classification (4):
358/1.1

Current US Cross Reference Classification (5):
358/1.14

Current US Cross Reference Classification (6):
358/1.8

Full | Title | Citation | Front | Review | Classification | Date | Reference | ... | Claims | KWIC | Draw De

☐ 36. Document ID: US 5808755 A

L5: Entry 36 of 70 File: USPT Sep 15, 1998

DOCUMENT-IDENTIFIER: US 5808755 A
TITLE: Toner dependent rosette structures in multi-layer screening by phase modulation

Detailed Description Text (19):
In order to get a screen according to the current invention, the shift is made along or parallel to an internal diagonal. As in the example above, the (-1,-1) diagonal can be chosen. While the halftone dot is growing, the center shifts from (0,0) to (-1,-1). To obtain a screen according to the current invention one selects additional micro dots which are connected to the existing halftone dot to increase the halftone dot size. The maximum length of the shift from (0,0) to (-1,-1) is 2.sup.1/2. For a recording system capable of rendering images with a density precision of eight bits, a cell can be thought to consist of 256 micro dots arranged in sixteen lines and sixteen columns. The maximum shift of 2.sup.1/2 expressed in micro dots would be 16/2.sup.1/2 =11.31. A linear shift comprises a shift of this maximum distributed over 256 pixels and hence represents a distance of 11.31/256=0.044 micro dots for each grey level.

Current US Original Classification (1):
358/3.17

Current US Cross Reference Classification (1):
358/3.2

Current US Cross Reference Classification (2):
358/533

Current US Cross Reference Classification (3):
358/536

Full | Title | Citation | Front | Review | Classification | Date | Reference | ... | Claims | KWIC | Draw De

☐ 37. Document ID: US 5777757 A

L5: Entry 37 of 70 File: USPT Jul 7, 1998

Record List Display

DOCUMENT-IDENTIFIER: US 5777757 A
TITLE: Method and system for halftoning

Detailed Description Text (5):
The elements in the threshold array 100 are arranged in a particular manner to create a pattern or screen. The screen for threshold array 100 is one that is known in the art as a cluster dot. A cluster dot is one in which the pixels in the halftone cell are clustered together in order to form halftone dots. Characteristics of cluster dots include halftone screen frequency, screen angle, halftone dot shape and the growth of the halftone dot size with increasing tonal value. All of these parameters influence the appearance of a printed halftone.

Current US Original Classification (1):
358/3.1

Current US Cross Reference Classification (1):
358/465

Current US Cross Reference Classification (2):
358/534

Current US Cross Reference Classification (3):
358/535

Current US Cross Reference Classification (4):
358/536

Current US Cross Reference Classification (5):
382/237

Current US Cross Reference Classification (6):
382/270

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw De

☐ 38. Document ID: US 5761349 A

L5: Entry 38 of 70 File: USPT Jun 2, 1998

DOCUMENT-IDENTIFIER: US 5761349 A
TITLE: Apparatus for reading optical data from a motion picture film and a light source therefor

Detailed Description Text (20):
The audio data recorded on the motion picture film 1 has a predetermined size. More specifically, an audio data dot may have a size of 26.4.mu..times.24.1.mu. as, for example, shown in FIG. 5. The relationship between the dot size and the parity may be as shown in FIG. 6, wherein it is observed that as the dot size increases, the error rate becomes improved, and when the dot size is reduced, more parity data is appended or added. As further shown in FIG. 6, the error correction capability may be represented by a quadratic curve with the transverse dot size of 24.1.mu. as an apex. As a result, since the present invention records audio data dots having a size of 26.4.mu..times.24.1.mu., which size corresponds to the maximum error

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correcting capability, accurate reproduction of the audio data is facilitated.

Detailed Description Text (29):
The audio data recorded on the motion picture film 1 has a predetermined size. More specifically, an audio data dot may have a size of 26.4.mu..times.24.1.mu. as, for example, shown in FIG. 5. The relationship between the dot size and the parity may be as shown in FIG. 6, wherein it is observed that as the dot size increases, the error rate becomes improved, and when the dot size is reduced, more parity data is appended or added. As further shown in FIG. 5, the error correction capability may be represented by a quadratic curve with the transverse dot size of 24.1.mu. as an apex. As a result, since the present invention records audio data dots having a size of 26.4.mu..times.24.1.mu., which size corresponds to the maximum error correcting capability, accurate reproduction of the audio data is facilitated.

Current US Original Classification (1):
382/312

☐ 39. Document ID: US 5666213 A

L5: Entry 39 of 70 File: USPT Sep 9, 1997

DOCUMENT-IDENTIFIER: US 5666213 A
** See image for Certificate of Correction **
TITLE: Image data processing system and method realizing fine image with simple construction/procedure

Brief Summary Text (7):
Reduction in dot (pixel) size of the dot matrix, that is, increasing the number of dots present in a unit area (increasing the dot-matrix resolution) may reduce such image degradation. However, such resolution increasing raises the cost by a great amount. In one example, obtaining of 600.times.600 dpi two-dimension bit-map as a result of doubling the resolution of the 300.times.300 one requires 4 times increase in the memory capacity and 4 times the processing speed increase of the data processing capability.

Current US Original Classification (1):
358/448

Current US Cross Reference Classification (1):
358/462

Current US Cross Reference Classification (2):
382/199

Current US Cross Reference Classification (3):
382/266

Current US Cross Reference Classification (4):
382/269

Record List Display

☐ 40. Document ID: US 5638463 A

File: USPT Jun 10, 1997

L5: Entry 40 of 70

DOCUMENT-IDENTIFIER: US 5638463 A
TITLE: Image-data processing system

Brief Summary Text (7):
Reduction in dot (pixel) size of the dot matrix, thereby increasing a number of dots present in a unit area (increasing a dot-matrix resolution), may reduce such image degradation. However, such resolution increase significantly raises the cost. For example, changing from a 300 dpi.times.300 dpi two-dimension bitmap to a 600 dpi.times.600 dpi one requires 4 times the memory capacity and 4 times the processing speed.

Current US Original Classification (1):
382/195

Current US Cross Reference Classification (1):
358/1.9

Current US Cross Reference Classification (2):
358/3.24

Current US Cross Reference Classification (3):
358/447

Current US Cross Reference Classification (4):
358/453

Current US Cross Reference Classification (5):
382/199

Current US Cross Reference Classification (6):
382/266

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWMC | Draw De

☐ 41. Document ID: US 5625716 A

File: USPT Apr 29, 1997

L5: Entry 41 of 70

DOCUMENT-IDENTIFIER: US 5625716 A
TITLE: Method for compensating for transfer characteristics of a printing system in a halftone screening process

Brief Summary Text (4):
Traditional AM screening uses variable-size halftone dots at fixed spacing in both dimensions. The size of the dot is increased by adding device pixels at its outer edge to increase the covered area. When viewed from a distance, the larger the dot

Record List Display

size, the greater the area covered and the darker the image area. Traditional screening has been termed "AM" or amplitude modulated screening, since the variable being changed was dot size (amplitude).

Current US Original Classification (1):
382/254

Current US Cross Reference Classification (1):
358/3.07

Current US Cross Reference Classification (2):
382/270

☐ 42. Document ID: US 5611022 A

File: USPT Mar 11, 1997

L5: Entry 42 of 70

DOCUMENT-IDENTIFIER: US 5611022 A
TITLE: Color imaging

Brief Summary Text (12):
Another technique for "grey scaling" is referred to as "screening," wherein the level of enhancement (darkness, brightness or color) of a pel is determined by the number of adjacently disposed small dots which are formed at the pel location. Thus, a lightly enhanced pel may be formed of one or two adjacently disposed small dots, while a highly enhanced pel may be formed of, for example, nine adjacently disposed small dots. According to further grey scaling techniques, the level of enhancement of a pel is controlled by adjusting the size of the dot formed at the pel location. However, these processes require a printing system which is capable of forming a selectable and variable number of adjacently disposed small dots or a selectable and variable size dot for each pel location (i.e., the printing system must be other than a bi-level system).

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (1):
358/465

Current US Cross Reference Classification (2):
358/466

☐ 43. Document ID: US 5602653 A

File: USPT Feb 11, 1997

L5: Entry 43 of 70

Record List Display

DOCUMENT-IDENTIFIER: US 5602653 A
TITLE: Pixel pair grid halftoning for a hyperacuity printer

Detailed Description Text (9):
The slope information indicates where an edge is supposed to exist. When an edge is present, the mark closest to the edge is adjusted such that it is tangential to the edge. The edge mark or dot is shifted in the fast scan direction, enlarged (or contracted), or a combination of the two. For a substantial vertical slope, the dot is shifted. For a flat slope, marks are grown from the center of the pixel to expand the edges outward. For slopes which ascend or descend at some high rate, the mark is grown from an appropriate fast scan direction edge to promote clustering and better edge positioning. For slow scan direction slopes, gray values are delivered by the corresponding addressability units which can move edges in the slow scan direction. Thus, the slope information input to the look-up table causes the corresponding dot size and position to be output. Constraining the size and position of a dot three or four pixels, i.e., seven or eight dots away, sets a boundary constraint on the inter-dot spacing of the intervening dots and potentially adjusts the carryover error. The space parameter constrains the maximum dot size for each pixel such that the minimum inter-dot spacing for the corresponding gray scale is maintained. The space parameter holds the value of the white area from the previous pixel pair. If the current pixel pair sum is not sufficient to maintain the white area, the space parameter adjusts the dot size and any shift in dot position imposed by an approaching or an immediate past edge in order to maintain the minimum distance between black dots.

Current US Original Classification (1):
358/3.26

Current US Cross Reference Classification (1):
358/463

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 44. Document ID: US 5588094 A

L5: Entry 44 of 70 File: USPT Dec 24, 1996

DOCUMENT-IDENTIFIER: US 5588094 A
TITLE: Post-processing bit-map decimation compensation method for printing high quality images

Brief Summary Text (25):
The digital halftoning techniques permit an increase in addressability to enhance printer resolution. No change in dot size in the direction of increased resolution such as the direction of the path of print medium travel will, however, cause placement of overlapping dots when a darkening of consecutive pixels in the direction of increased resolution is called for in the halftone pattern. The present invention reduces excessive dot overlap but maintains edge information by performing post-processing bit-map decimation compensation on bit map data just before they are transmitted to the printer for printing. The removal from the bit map data corresponding to obscured dots renders nonoverlapping dots occupying a region of the same size as that if no bit-map decimation had been implemented.

Current US Original Classification (1):

h b e ef b e

Record List Display

358/1.9

Current US Cross Reference Classification (1):
358/3.06

Current US Cross Reference Classification (2):
358/3.18

Current US Cross Reference Classification (3):
358/3.2

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

☑ 45. Document ID: US 5532828 A

File: USPT Jul 2, 1996

L5: Entry 45 of 70

DOCUMENT-IDENTIFIER: US 5532828 A
TITLE: Image forming apparatus with edge smoothing

Brief Summary Text (16):
According to the present invention there is still further provided an image forming apparatus for forming an image comprising: a dot forming unit responsive to a drive signal for forming a dot on a pixel when the drive signal indicates forming the dot; an edge detection circuit for generating a deletion signal, an addition signal, and a directional signal, the deletion signal indicating that the video density signal of the pixel shows a shadow level and there is a first edge adjacent to the pixel in a first image indicated by the video density signal, the addition signal indicating that the video density signal of the pixel shows a highlight level and there is a second edge adjacent to the pixel in a second image indicated by the video density signal, the directional signal indicating directions of the first and second edges from the pixel; and a drive signal generation circuit for generating the drive signal to change a size of the dot in accordance with a video density signal, for further reducing the size of the dot in accordance with the deletion signal in the presence of the deletion signal, and for further increasing the size of the dot in accordance with the addition signal in the presence of the addition signal, and for determining a position of the size-changed dot within the pixel in accordance with the directional signal.

Current US Original Classification (1):
358/3.15

Current US Cross Reference Classification (3):
382/254

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 46. Document ID: US 5505777 A

File: USPT Apr 9, 1996

L5: Entry 46 of 70

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DOCUMENT-IDENTIFIER: US 5505777 A
TITLE: Computer controlled viscous fluid dispensing system

Detailed Description Text (15):
CAD data from a disk or a computer integrated manufacturing (CIM) controller are utilized by the computer 18 to control the motion of the dot generator 12 through the motion controller 42. This ensures that the minute drops of adhesive are accurately placed on the printed circuit board 36 at predetermined locations. In applications where CAD data is not available, the software utilized by the computer 18 allows for the locations of the dots to be directly programmed. The computer 18 utilizes the X and Y locations, the component types and the component orientations to determine where and how many drops of adhesive to dispense onto the upper surface of the circuit board 36. The computer 18 automatically assigns dot sizes to specific components based on the user specifications or component library. The path for dispensing the minute drops of adhesive is optimized by aligning the in-line points. Our system has a simple set-up process. The first step in the set-up process is to install a nozzle assembly and a full adhesive syringe. The nozzle assembly is preferably of a disposable type designed to eliminate air bubbles in the fluid flow path. One suitable disposable nozzle is disclosed in U.S. patent application Ser. No. 08/187,644, filed Jan. 27, 1994 entitled DISPOSABLE NOZZLE ASSEMBLY FOR HIGH SPEED VISCOUS MATERIAL DROPLET DISPENSER, the entire disclosure of which is incorporated herein by reference. After the installation of the disposable nozzle assembly and the adhesive syringe, the system runs through a self diagnostic set-up program and dot calibration routine to ensure correct operation. The dot generator 12 is first moved to the nozzle priming station 24 (FIG. 1) where the disposable nozzle assembly is mated with a resilient priming boot. Using an air cylinder (not shown) a vacuum is then pulled on the boot to suck adhesive from the syringe, through the disposable nozzle assembly. During this time the syringe of the dot generator 12 is pressurized from the air supply. The dot generator 12 is then moved to the nozzle calibration set-up station 26 and dot calibration is achieved by shooting a test pattern of dots onto a sample substrate and measuring the diameter of the dots using the camera and light ring assembly 16 and vision circuit 44 (FIG. 2). The dispensed dot size is compared with a reference and adjustments are made automatically.

Detailed Description Text (19):
Current viscous material droplet dispensers require the user to go through a trial and error process to set up the machine in order to obtain the desired dot size. A trial run is made, the results are observed and measured, and valve parameters are adjusted until the desired dot size is achieved. The software utilized by the computer 18 of our system automates the dot size calibration routine. The computer 18 controls the dot generator 12 through the dot generator controller 40. The computer 18 keeps track of a fluid parameter table in a disk file. This table sets forth the parameters of the latest fluid in use. The user specifies the desired dot sizes via the computer keyboard. Through the automatic dot size calibration software, the computer 18 is capable of commanding a number of preselected dot sizes, for example, five. The computer 18 controls the stroke of the nozzle through the dot generator controller 40. The computer 18 then measures the dot diameter, area and position through the camera and light ring assembly 16 and vision circuit 44. The computer then establishes a curve of dot diameters or areas as a function of stroke length. Using linear extrapolation, the computer can then determine the correct stroke length to produce the predetermined desired dot size. The computer also uses position information to compensate for dot placement accuracy as described hereafter. Each time a new stroke value is computed, the system needs to re-calibrate the nozzle re-fill step in order to establish the correct air ON time.

Current US Cross Reference Classification (13):

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382/145

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 47. Document ID: US 5479189 A

File: USPT Dec 26, 1995

L5: Entry 47 of 70

DOCUMENT-IDENTIFIER: US 5479189 A
TITLE: 4 channel color display adapter and method for color correction

Brief Summary Text (12):
There are three primary difficulties with the prior art approaches used for this purpose. The first problem is that the transformation from RGB to CMYK results in unfaithful reproduction of the desired colors. There are several reasons for the lack of accurate color reproduction in the printed media. Among these is additivity failure of inks caused by color masking. This masking occurs when inks of various colors are applied on top of each other, and the transparency of each ink affects the observed color. The observed color is also found to depend on the order of application of the inks. The second problem is that the actual color displayed on the monitor may not be the same as the desired color. This occurs because there is no commonly observed manufacturing standard governing the production of any particular color gamut on a color monitor. In fact, most color monitors have user adjustments to enable changing colors to satisfy the user's individual desires. Aging of the phosphors in the monitor also contributes to temporal instability of the colors available. Prior art systems have sought to relieve this problem with orthogonal correction look-up tables, one for each color channel. These systems would completely eliminate the error if the individual color channels were fully orthogonal and not interdependent, but this is not the case. An example of non-orthogonality is ink color masking. If the printed dot is of sufficiently small pitch, the system is generally additive. If, for example, the last applied ink is cyan, and the density of cyan increases, then the dot size of cyan will grow until it begins to mask the surrounding colors. Such prior art look-up tables would fail to subdue the masked colors in the presented image. A third problem is that the absence of a dedicated black channel available for color editing means that the user generally can't control the specific relationships between the black channel and the other color channels because the black channel is not explicitly displayed.

Current US Cross Reference Classification (2):
358/523

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 48. Document ID: US 5367673 A

File: USPT Nov 22, 1994

L5: Entry 48 of 70

DOCUMENT-IDENTIFIER: US 5367673 A
TITLE: System for queueing request from remote stations for proof processing of

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files that are transmitted only when processing resources become available

Brief Summary Text (7):
Unfortunately, modern printing presses do not possess the capability of applying differential amounts of ink to any location in an image being printed. Rather, these presses are only designed to either apply or not apply a single amount of ink to any given location on a page. Therefore, a printing press is unable to directly print a contone separation. To successfully circumvent this problem, halftone separations are used instead. An image formed from any single color halftone separation encodes the density information inherent in a color image from amplitude modulated form into a spatial (area) modulated form, in terms of dot size, which is subsequently integrated by the human eye into a desired color. By smoothly changing dot sizes (areas), smooth corresponding tonal variations will be generated in the reproduced image. Given this, the art has taught for some time that a full color image can be formed by properly overlaying single color halftone reproductions for all of the primary subtractive colors, where each reproduction is formed from a halftone dot separation that contains dots of appropriate sizes and in one of these primary colors. Clearly, as size of the dots decreases, an increasing amount of detail can be encoded in a dot pattern and hence in the reproduced image. For that reason, in graphic arts applications, a halftone separation utilizes very small dots to yield a relatively high dot pitch (resolution).

Current US Cross Reference Classification (1):
358/534

Current US Cross Reference Classification (2):
382/167

☐ 49. Document ID: US 5359424 A

L5: Entry 49 of 70 File: USPT Oct 25, 1994

DOCUMENT-IDENTIFIER: US 5359424 A
TITLE: Thermal transfer image forming apparatus using different gamma functions for different density ranges

Detailed Description Text (29):
That is, in the case where the density of the area constituted by the thus sampled four pixels is low, dots corresponding to the pixel data D11 assigned for the gamma characteristic conversion function .gamma.1 are printed (FIG. 15(I)). As the density of the sampled area increases, dots 40 corresponding to the pixel data D22 assigned for the gamma characteristic conversion function .gamma.4 are also printed (FIG. 15(II)). As the density of pixel data increases further, the size of dots corresponding to the pixel data D11 and D22 increases so that an image is printed to narrow the island-like blank portions 41 (FIG. 15(III), 15(IV) and 15(V)). As the result of forming the island-like blank portions 41, ink of the area proportional to the density of image data is transferred to recording paper securely without wasteful peeling of ink from the ink sheet even in the case of printing of high-density data.

Detailed Description Text (57):
That is, in the case where the density of the area constituted by the thus sampled

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16 pixels is low, dots corresponding to the pixel data D11, D13, D31 and D33 assigned for the first gamma characteristic conversion function group are printed (FIG. 39(I)). As the density of the sampled area increases, dots 60 corresponding to the pixel data D22, D24, D42 and D44 as signed for the second gamma characteristic conversion function group are also printed (FIG. 39(II)). As the density of pixel data increases further, the size of dots corresponding to the pixel data D11 and D22 increases so that an image is printed to narrow the island-like blank portions 61 (FIG. 39(III), 39(IV) and 39(V)). As the result of forming the island-like blank portions 61, ink of the area proportional to the density of image data is transferred to recording paper securely without wasteful peeling of ink from the ink sheet even in the case of printing of high-density data.

Current US Original Classification (1):
358/296

Current US Cross Reference Classification (3):
358/3.12

Current US Cross Reference Classification (4):
358/461

☐ 50. Document ID: US 5333069 A

File: USPT

Jul 26, 1994

L5: Entry 50 of 70

DOCUMENT-IDENTIFIER: US 5333069 A
TITLE: Technique for use in conjunction with an imaging system for providing an appearance match between two images and for calibrating the system thereto

Brief Summary Text (20):
However, a proofing system with variable tone and color reproduction characteristics often presents the technician with an enormous number of different possible combinations of the settings. For example, for the system described in the '459 Cowan et al patent, the solid area density and dot size can be set for each of the four process colors (C, Y, M and K) at any of 20 different density levels and at any of 15 different dot size settings. For the DDCP system described in the '940 Spence application, the number of solid area density settings is considerably larger, with, e.g., the number of dot size settings alone (comprising specification of several control points) numbering well into the thousands. In view of the resulting huge number of potential combinations of settings, an experienced color technician often needs to run and separately analyze quite a few successive proofs in order to select a suitable solid area density and halftone dot size setting (or an entire tone reproduction curve shape) for each different colorant in order to achieve an acceptable match between the proof image and a target image and thereby calibrate the proofing system to the target imaging system. Moreover, additional time is consumed whenever the technician is forced to resort to trial-and-error experimentation or, in a worst case scenario, guesswork: either merely as a result of iterating through a very large number of possible combinations to discern the performance inter-relationships of the proofing system and/or by incorrectly relying on intuition and initially iterating away from a proper operating condition. An example of the latter situation can occur where the technician, based upon his own intuition, views a proof image against a target image and decides that the yellow content in the proof image needs to be increased. While the technician

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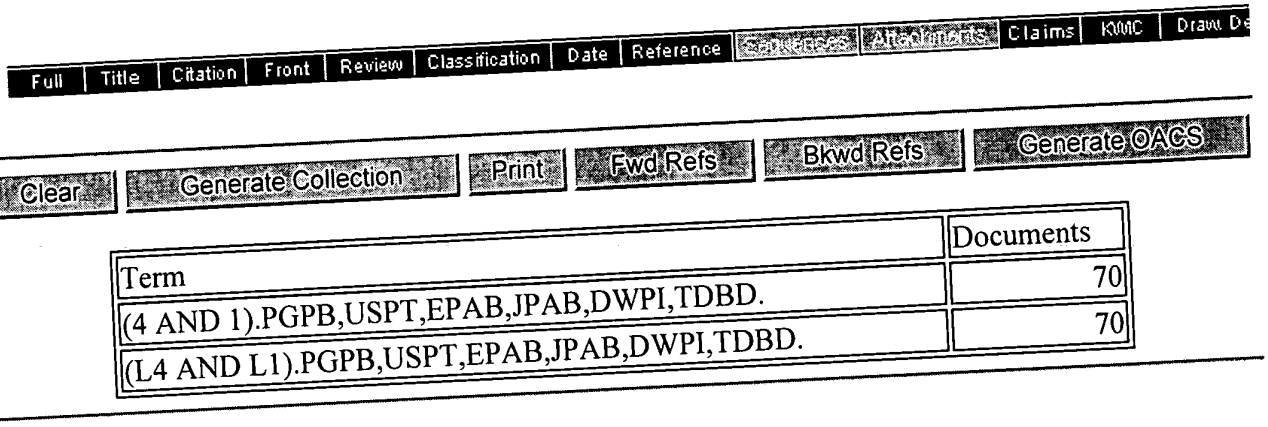
may decide to initially increase the halftone dot size for the yellow colorant, the proper operating condition may instead involve reducing the halftone dot sizes for all the colorants but reducing the halftone dot size for yellow less than that for each of the other colorants.

Current US Original Classification (1):
358/517

Current US Cross Reference Classification (1):
358/518



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☐ 51. Document ID: US 5331429 A

L5: Entry 51 of 70 File: USPT Jul 19, 1994

DOCUMENT-IDENTIFIER: US 5331429 A
TITLE: Digital generation of halftone images with error diffusion and frequency matched periodic screen rulings

Brief Summary Text (13):
Error diffusion, or adaptive dither techniques for halftone image generation are known. In error diffusion, the error introduced by marking each individual output pixel white or black, as compared to the desired image pixel grey shade, is diffused to neighboring output pixels. Error diffusion does not produce the traditional dot pattern of halftone screens. In some systems, grey shades are simulated using very small dots which are too fine to be well reproduced by most marking or reproduction devices. In U.S. Pat. No. 5,055,942 to the present inventor, an error diffusion technique is disclosed in which the coarseness of the halftone is controllable by adjustment of a hysteresis constant. Although image coarseness (i.e., the dot size, and therefore the dot frequency) is adjustable, the resulting halftones do not have a fixed periodic dot frequency (screen ruling) for all gray shade values, but instead tend to result in halftones having somewhat different size dots within a range of different periodic dot frequencies.

Current US Original Classification (1):
358/3.18

Current US Cross Reference Classification (1):
358/3.16

Current US Cross Reference Classification (2):
358/445

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 52. Document ID: US 5317425 A

L5: Entry 52 of 70 File: USPT May 31, 1994

DOCUMENT-IDENTIFIER: US 5317425 A
TITLE: Technique for use in conjunction with an imaging system for providing an appearance match between two images and for calibrating the system thereto

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Brief Summary Text (16):
However, a proofing system with variable tone and color reproduction characteristics often presents the technician with an enormous number of different possible combinations of the settings. For example, for the system described in the U.S. Pat. No. '459 Cowan et al patent, the solid area density and dot size can be set for each of the four process colors (C, Y, M and K) at any of 20 different density levels and at any of 15 different dot size settings. In view of the resulting huge number of potential combinations of settings, an experienced color technician often needs to run and separately analyze quite a few successive proofs in order to select a suitable solid area density and halftone dot size setting for each different colorant in order to achieve an acceptable match between the proof and a press sheet and thereby calibrate the proofing system to the press. Moreover, additional time is consumed whenever the technician is forced to resort to trial-and-error experimentation or, in a worst case scenario, guesswork: either merely as a result of iterating through a very large number of possible combinations to discern the performance inter-relationships of the proofing system and/or by incorrectly relying on intuition and initially iterating away from a proper operating condition. An example of the latter situation can occur where the technician, based upon his own intuition, views a proof against a press sheet and decides that the yellow content in the proof needs to be increased. While the technician may decide to initially increase the halftone dot size for the yellow colorant, the proper operating condition may instead involve reducing the halftone dot sizes for all the colorants but reducing the halftone dot size for yellow less than that for each of the other colorants.

Current US Original Classification (1):
358/504

Current US Cross Reference Classification (1):
358/523

Current US Cross Reference Classification (2):
358/535

☐ 53. Document ID: US 5293539 A

L5: Entry 53 of 70 File: USPT Mar 8, 1994

DOCUMENT-IDENTIFIER: US 5293539 A
TITLE: Method and apparatus for calibrating tone reproduction in a proofing system

Brief Summary Text (7):
Modern offset printing presses do not possess the capability of applying differential amounts of ink to any location in an image being printed. Rather, these presses are only designed to either apply or not apply a single amount of ink to any given location on a page. Therefore, an offset printing press is unable to directly print a contone separation. To successfully circumvent this problem, halftone separations are used instead. An image formed from any single color halftone separation encodes the density information inherent in a color image from amplitude modulated form into a spatial (area) modulated form, in terms of dot size, which is subsequently integrated by the human eye into a desired color. By smoothly changing halftone dot sizes (dot areas), smooth corresponding tone

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variations will be generated in the reproduced image. Given this, the art has taught for some time that a full color image can be formed by properly overlaying single color halftone reproductions for all of the primary subtractive colors, where each reproduction is formed from a halftone dot separation that contains dots of appropriate sizes and in one of these primary colors. Clearly, as size of the dots decreases, an increasing amount of detail can be encoded in a dot pattern and hence in the reproduced image. For that reason, in graphic arts applications, a halftone separation utilizes very small dots to yield a relatively high dot pitch (resolution).

Current US Original Classification (1):
358/527

Current US Cross Reference Classification (1):
358/406

☐ 54. Document ID: US 5287209 A

L5: Entry 54 of 70 File: USPT Feb 15, 1994

DOCUMENT-IDENTIFIER: US 5287209 A
TITLE: Image forming device for enhancing tone reproduction by changing dot size

Abstract Text (1):
An image forming device which perform tone reproduction of a by changing the size of dots according to input image data comprising a plurality of pixels, each of which has an image density. A block partitioning portion partitions the input image data into blocks, each which has a predetermined number of pixels and each of the pixels having a predetermined position within each of the blocks. A tone modulation portion determines priorities corresponding to predetermined positions of the pixels within each of the blocks and changes the size of the dots according to the image densities of the pixels within the block. The tone modulation portion increases the size of the dots corresponding to the pixels in such a manner that the size of one of the dots corresponding to one of the pixels is larger than that of another one of the dots corresponding to another one of the pixels having a lower priority than one of the pixels but having the same image density. The degradation of resolution and moire effects are avoided.

Brief Summary Text (30):
To achieve the forgoing object, in accordance with the present invention, there is provided an image forming device which forms an image comprising a plurality of dots from input image data comprising a plurality of pixels, each of which has an image density. A block partitioning means partitions the input image data into blocks, each of the blocks having a predetermined number of pixels and each of the pixels having a predetermined position within each of the blocks. A tone modulation processor determines priorities corresponding to predetermined positions of the pixels within each of the blocks. The tone modulation processor changes the size of the dots according to the image densities of the pixels within the block by increasing the size of the dots corresponding to the pixels in such a manner that the size of one of the dots corresponding to one of the pixels is larger than that of another one of the dots corresponding to another one of the pixels having a lower priority but having the same image density.

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Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (1):
358/3.12

CLAIMS:

1. An image forming device for forming an image comprising a plurality of dots from input image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels.

2. An image forming device for forming an image comprising a plurality of dots from input image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein before the size of a dot corresponding to a pixel having a predetermined priority reaches the maximum size thereof, said tone modulation processing means increases the size of a dot corresponding to another pixel having the next priority lower than the predetermined priority.

3. An image forming device for forming an image comprising a plurality of dots from input image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image

density as said one of said pixels, wherein said tone modulation processing means limits the size of a dot corresponding to a pixel having a predetermined priority to predetermined size.

4. An image forming device for forming an image comprising a plurality of dots from input image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein said tone modulation processing means selects the size of a dot corresponding to a pixel having the lowest priority from a predetermined two kinds of a size according to the density of the pixel having the lowest priority.

5. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and corresponding to recording colors used to record the pixels and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels.

6. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and corresponding to recording colors used to record the pixels and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein before the size of a dot corresponding to a pixel having a predetermined priority reaches the maximum size thereof, said tone

modulation processing means increases the size of a dot corresponding to another pixel having the next priority lower than the predetermined priority.

7. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and corresponding to recording colors used to record the pixels and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein said tone modulation processing means limits the size of a dot corresponding to a pixel having a predetermined priority to predetermined size.

8. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and corresponding to recording colors used to record the pixels and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein said tone modulation processing means limits the size of a dot corresponding to a pixel having the lowest priority from a predetermined two kinds of size according to the density of the pixel having the lowest priority.

9. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data corresponding to recording colors used to record pixels into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image

density as said one of said pixels.

10. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data corresponding to recording colors used to record pixels into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein before the size of a dot corresponding to a pixel having a predetermined priority reaches the maximum size thereof, said tone modulation processing means increases the size of a dot corresponding to another pixel having the next priority lower than the predetermined priority.

11. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data corresponding to recording colors used to record pixels into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and corresponding to recording colors used to record the pixels and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein said tone modulation processing means limits the size of a dot corresponding to a pixel having a predetermined priority to predetermined size.

12. An image forming device for forming an image comprising a plurality of dots from input color image data comprising a plurality of pixels, each of which having an image density, said image forming device, comprising:

block partitioning means for partitioning said input color image data corresponding to recording colors used to record pixels into blocks, each of said blocks having a predetermined number of pixels, each of said pixels having a predetermined position within each of said blocks; and

tone modulation processing means for determining priorities corresponding to said predetermined positions of said pixels within each of said blocks and corresponding to recording colors used to record the pixels and for changing the size of said dots according to the image densities of said pixels within said block by increasing the size of said dots corresponding to said pixels in such a manner that the size of one of said dots corresponding to one of said pixels is larger than that of another one of said dots corresponding to another one of said pixels having

a lower priority that said one of said pixels and the same image density as said one of said pixels, wherein said tone modulation processing means limits the size of a dot corresponding to a pixel having a the lowest priority from a predetermined two kinds of size according to the density of the pixel having the lowest priority.

17. An image forming device for performing gradational recording by changing the size of each individual dot according to input image data, comprising:

a block partitioning means for partitioning the input image data into a plurality of blocks in such a manner that each of the blocks has a plurality of pixels; and

a tone modulation processing means for determining the size of dots which should be printed, by making different input-image-tone-level-to-output-level characteristics correspond to the positions of the pixels of each of the blocks and then determining an output level of a dot corresponding to each pixel of each block corresponding to an input image tone level thereof according to the corresponding characteristic and for printing the dot of each of the pixel of each block, wherein the size of a dot corresponding to a pixel which corresponds to one of the characteristics having a high output level next to another specific one of the characteristics corresponding to each input image tone level, increases before the size of a dot corresponding to a pixel which corresponds to the specific one of the characteristics reaches the maximum size thereof.

21. An image forming device for performing gradational recording by changing the size of each individual dot according to input color image data, comprising:

a block partitioning means for partitioning the input color image data into a plurality of blocks in such a manner that each of the blocks has a plurality of pixels; and

a tone modulation processing means for determining the size of dots which should be printed, by making different input-image-tone-level-to-output-level characteristics correspond to the positions of the pixels of each of the blocks in such a manner that the different characteristics correspond to different colors, and then determining an output level of a dot corresponding to each pixel of each block corresponding to an input image tone level thereof according to the corresponding characteristic and for printing the dot of each of the pixel of each block, wherein the size of a dot corresponding to a pixel which corresponds to one of the characteristics having a high output level next to another specific one of the characteristics corresponding to each input image tone level, increases before the size of a dot corresponding to a pixel which corresponds to the specific one of the characteristics reaches the maximum size thereof.

25. An image forming device for performing gradational recording by changing the size of each individual dot according to input color image data, comprising:

a block partitioning means for partitioning the input color image data into a plurality of blocks in different manners corresponding to the colors in such a manner that each of the blocks has a plurality of pixels; and

a tone modulation processing means for determining the size of dots which should be printed, by making different input-image-tone-level-to-output-level characteristics correspond to the positions of the pixels of each of the blocks in such a manner that the different characteristics correspond to different colors, and then determining an output level of a dot corresponding to each pixel of each block corresponding to an input image tone level thereof according to the corresponding characteristic and for printing the dot of each of the pixel of each block, wherein the size of a dot corresponding to a pixel which corresponds to one of the characteristics having a high output level next to another specific one of the

characteristics corresponding to each input image tone level, increases before the size of a dot corresponding to a pixel which corresponds to the specific one of the characteristics reaches the maximum size thereof.

☐ 55. Document ID: US 5270827 A

L5: Entry 55 of 70 File: USPT Dec 14, 1993

DOCUMENT-IDENTIFIER: US 5270827 A
TITLE: Optical recording system for controlling recording light quantity based on pixel patterns in an image

Brief Summary Text (6):
A modulation circuit 55 converts image data (printing information) into an electrical signal and produces a modulated electrical signal, which signal is used to drive a laser beam source 54 thereby to produce a laser beam 51. The laser beam 51 scans while being irradiated on a light-sensitive material drum 50 through a mirror 52 rotated by a motor 53. In this optical recording system, attention is paid only to the pixel data to be recorded Specifically, this data is appropriately corrected and the exposure amount on the light sensitive material is modulated for recording purposes on the basis of the pixel data thus corrected. The recording of the same pixel data, however, is known to require different methods of correction or modulation for recording a high-quality image depending on what kind of image the particular pixel data belongs to in the whole picture. In the case of reversal development for monochromatic binary recording using a laser printer to record the exposed surface portion of the light-sensitive material in black color and the unexposed portion thereof in white color, for example, the black pixels for recording a large black area (hereinafter called "the solid image") and those of other lines or characters must be processed in different ways if a high-quality recording is to be achieved. Let us apply this idea to the laser printer using the reversal phenomenon in a system disclosed by JP-A-62-26621. In the case where the pixels above and below the black pixels to be recorded (hereinafter called "the recording black pixels") are black, the surface of the light-sensitive material corresponding to the recording black pixels is exposed with greater intensity in recognition of the fact that the recording black pixels are those included in a solid image. This increases the diameter of the recording dots corresponding to the size of the recording per beyond a prescribed value and therefore white portions in the solid image caused by irregular intervals of beam scannings are removed, thereby making it possible to record a high-quality solid image. In the case where the pixels above or below the black pixels to be recorded are white, on the other hand, the black pixels to be recorded are recognized to be those within lines or characters, and thus are exposed less intensely so that the diameter of the recording dots is identical to a prescribed size. In this way, the quantity of the laser light emitted is controlled for each pixel to improve the quality of the solid image portion without adversely affecting the image quality of lines or characters, resulting in a high-quality recording of the particular image as a whole.

Current US Original Classification (1):
358/3.02

h e b b cg b cc e

Current US Cross Reference Classification (4):
358/3.24

Current US Cross Reference Classification (5):
358/3.27

Current US Cross Reference Classification (6):
358/406

Current US Cross Reference Classification (7):
358/504

☐ 56. Document ID: US 5268774 A

L5: Entry 56 of 70 File: USPT Dec 7, 1993

DOCUMENT-IDENTIFIER: US 5268774 A
TITLE: Halftoning with enhanced dynamic range and edge enhanced error diffusion

Detailed Description Text (6):
In accordance with another aspect of the invention, the threshold values of dither pattern M are selected having a dynamic range greater than the possible dynamic range of the input pixel values. Using a standard dither pattern with a dynamic range that is equal to or less than the range of the input values, such as perhaps that shown in FIG. 2A for the case of input values in the range from 0 to 255, each threshold level in the dither pattern is multiplied by a factor f, where f is much greater than 1 and increases with halftone cell or dot size. For example, for a 4.times.2 screen, f=4; for a 8.times.4 screen, f=8; and for a 10.times.5 screen, f=10. These values are only examples, and even for the particular screen sizes cited, other values of f may be provided. It will be understood that value of f is greater than 1, and increases with dot size. Of course, screens with such threshold values could be constructed, but users tend to have a large selection of screens in their possession. Accordingly, a simple multiplier arrangement, such as that provided by the combination of dither matrix storage 44 and dynamic range multiplier 46, is desirable. As previously noted, this value fM.sub.n,l is then used in the calculation of T.sub.n,l. Alternatively, the original dither matrix (FIG. 2a) may be stored into the dither storage block 44 through a multiplier. In such a case, block 46 can be eliminated and the extended dynamic range dither matrix (FIG. 2b) can directly be addressed by the pixel and scan line clock. In any case, the value directed to threshold calculator operates as if the example dither matrix of FIG. 2B were being used.

Current US Original Classification (1):
358/466

Current US Cross Reference Classification (1):
358/445

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h e b b cg b cc e

☐ 57. Document ID: US 5258850 A

L5: Entry 57 of 70 File: USPT Nov 2, 1993

DOCUMENT-IDENTIFIER: US 5258850 A
TITLE: Line screen design for gray scale rendering

Current US Original Classification (1):
358/3.15

Current US Cross Reference Classification (1):
358/3.21

CLAIMS:

6. The apparatus of claim 4 and wherein in accordance with the first template, dot sizes are increased simultaneously at plural pixel locations along a first line in a cell when the cell gray level is increased from one cell gray level to a second and next succeeding cell gray level.

10. The apparatus of claim 8 and wherein in accordance with a second template, every second pixel location along the first line grows in dot size simultaneously upon an increase from a third cell gray level to a fourth next succeeding cell gray level.

11. The apparatus of claim 10 and wherein in accordance with a third template, every third pixel location along the first line grows in dot size simultaneously upon an increase from a fifth cell gray level to a sixth cell gray level.

16. The method of claim 14 and wherein in accordance with the first template, dot sizes are increased simultaneously at plural pixel locations along a first line in a cell when the cell gray level is increased from one cell gray level to a second and next succeeding cell gray level.

20. The method of claim 18 and wherein in accordance with a second template, every second pixel location along the first line grows in dot size simultaneously upon an increase from a third cell gray level to a fourth next succeeding cell gray level.

21. The method of claim 20 and wherein in accordance with a third template, every third pixel location along the first line grows in dot size simultaneously upon an increase from a fifth cell gray level to a sixth cell gray level.

☐ 58. Document ID: US 5258849 A

L5: Entry 58 of 70 File: USPT Nov 2, 1993

DOCUMENT-IDENTIFIER: US 5258849 A
TITLE: Halftone dot arrangement in gray level halftone printing

h e b b cg b cc e

Abstract Text (1):
A method and apparatus for reproducing an original image, having a scanner which scans and digitizes the original image into pixels, a controller coupled to the scanner to receive the digitized original image, and which produces a first signal corresponding to a gray level halftoned representation of the digitized original image, and a printer coupled to the controller to receive the first signal and which produces a gray level halftoned reproduction of the original image. The controller groups the pixels into cells that each have a determined cell gray level, and controls the formation of dots within the pixels of an individual cell by the printer such that for each increase in cell gray level, a dot at at least one of the pixels in the cell forms to a larger dot-size. Sequential forming of the dots occurs at the pixels in the cell in a pre-defined order such that each dot is formed to a first dot-size less than a maximum dot-size before beginning the formation of a dot at another pixel within the cell. When all of the dots in the cell have been formed to the first dot-size corresponding to a specific cell gray level, the dot-size of each of the dots is increased in the pre-defined order to a second dot-size, corresponding to increasing cell gray levels.

Brief Summary Text (13):
This and other needs are met by the present invention which provides an arrangement for reproducing an original image, comprising a scanner which scans and digitizes the original image into pixels, a controller coupled to the scanner to receive the digitized original image, and which produces a first signal corresponding to a gray level halftoned representation of the digitized original image, and a printer coupled to the controller to receive said first signal and which produces a gray level halftoned reproduction of the original image. The controller groups the pixels into cells that each have a determined cell gray level, and controls the formation of dots within the pixels of an individual cell by the printer such that for each increase in cell gray level, a dot at at least one of said pixels in the cell forms to a larger dot-size. Sequential forming of the dots occurs at the pixels in the cell in a pre-defined order such that each dot is formed to a first dot-size less than a maximum dot-size before beginning the formation of a dot at another pixel within the cell. When all of the dots in the cell have been formed to the first dot-size corresponding to a specific cell gray level, the dot-size of each of the dots is increased in the pre-defined order to a second dot-size, corresponding to increasing cell gray levels.

Brief Summary Text (14):
The earlier stated need is also met by a method, according to an embodiment of the present invention, of producing gray level halftone screens. This method includes the steps of controlling a gray level printhead such that the printhead forms dots on a recording medium at pixel locations, the pixel locations being grouped into cells having cell gray levels. The dots of a cell are formed such that for each increase in cell gray level, a dot at at least one of the pixels in the cell forms to a larger dot-size. The dots are sequentially formed at the pixels in the cell in a pre-defined order such that each dot is formed to a first dot-size less than a maximum dot-size before beginning the formation of a dot at another pixel within the cell. When all of the dots in the cell have been formed to the first dot-size corresponding to a specific cell gray level, the dot-size of each of the dots is increased in the pre-defined order to a second dot-size, corresponding to increasing cell gray levels.

Current US Original Classification (1):
358/3.12

CLAIMS:

1. An apparatus for reproducing an original image, comprising:

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a scanner which scans and digitizes the original image into pixels;

a controller means coupled to the scanner to receive the digitized original image, and which produces a first signal corresponding to a gray level halftoned representation of the digitized original image; and

a printer coupled to the controller to receive said first signal and which produces a gray level halftoned reproduction of the original image;

wherein the controller means groups the pixels into cells that each have a determined cell gray level, and controls the formation of dots within the pixels of an individual cell by the printer such that for each increase in cell gray level, a dot at at least one of said pixels in the cell forms to a larger dot-size, with sequential forming of dots occurring at the pixels in the cell in an order such that each dot is formed to a first dot-size, larger than a minimum dot size but less than a maximum dot-size, before beginning the formation of a dot at another pixel within the cell, and when all of the pixels in the cell have been formed to the first dot-size corresponding to a specific cell gray level, providing further sequential increases in cell gray levels by correspondingly sequentially increasing the dot-size of each of the dots in said cell to a second dot-size, to provide progressive corresponding increases in cell gray levels by distributing said increases successively to different pixels in the cell.

2. A method of producing gray level halftone screeens, comprising:

controlling a gray level printhead such that the printhead forms a dot of variable dot size on a recording medium at each of plural pixel locations, the pixel locations being grouped into cells having cell gray levels, wherein the dots of a cell are formed such that for each increase in cell gray level, a dot at at least one of said pixels in the cell forms a larger dot-size;

sequentially forming the dots at the pixels in the cell in an order such that each dot is formed to a first dot-size, larger than a minimum dot size but less than a maximum dot-size before beginning the formation of a dot at another pixel within the cell;

when all of the dots have been formed to the first dot-size corresponding to a specific cell gray level, providing further sequential increases in cell gray levels by correspondingly sequentially increasing the dot-size of each of the dots to a second dot-size, to provide corresponding increases in cell gray levels by distributing said increases successively to different pixels in the cell.

☐ 59. Document ID: US 5255085 A

L5: Entry 59 of 70 File: USPT Oct 19, 1993

DOCUMENT-IDENTIFIER: US 5255085 A
TITLE: Adaptive technique for providing accurate tone reproduction control in an imaging system

Brief Summary Text (7):
Modern offset printing presses do not possess the capability of applying differential amounts of ink to any location in an image being printed. Rather,

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these presses are only designed to either apply or not apply a single amount of ink to any given location on a page. Therefore, an offset printing press is unable to directly print a contone separation. To successfully circumvent this problem, halftone separations are used instead. An image formed from any single color halftone separation encodes the density information inherent in a color image from amplitude modulated form into a spatial (area) modulated form, in terms of dot size, which is subsequently integrated by the human eye into a desired color. By smoothly changing halftone dot sizes (dot areas), smooth corresponding tone variations will be generated in the reproduced image. Given this, the art has taught for some time that a full color image can be formed by properly overlaying single color halftone reproductions for all of the primary subtractive colors, where each reproduction is formed from a halftone dot separation that contains dots of appropriate sizes and in one of these primary colors. Clearly, as size of the dots decreases, an increasing amount of detail can be encoded in a dot pattern and hence in the reproduced image. For that reason, in graphic arts applications, a halftone separation utilizes very small dots to yield a relatively high dot pitch (resolution).

Current US Original Classification (1):
358/527

Current US Cross Reference Classification (1):
358/406

☐ 60. Document ID: US 5204760 A

L5: Entry 60 of 70 File: USPT Apr 20, 1993

DOCUMENT-IDENTIFIER: US 5204760 A
TITLE: System and method for converting continuous half tone image into pseudo half tone image

Abstract Text (1):
In processing of a minimizer average error method (or an error diffusion method), a threshold value for determining whether a point (pixel) as an object to be processed is a black or white dot is changed in accordance with the pixel position using a threshold value matrix having a two-dimensional repetitive pattern. When a one-dot size in an output apparatus which can only perform binary expression in units of pixels is larger than a logical size, a continuous tone image is converted into a pseudo half tone image in consideration of an increase in size of a dot into other dots (projecting portions).

Detailed Description Text (25):
In the first embodiment, a threshold value for determining whether a point to be processed is a black or white dot is changed according to the pixel position using a two-dimensional repetitive pattern. In the second embodiment, when a one-dot size in an output apparatus which can only perform binary expression in units of pixels is larger than a logical size, a continuous tone image is converted into a pseudo half tone image in consideration of an increase in size of a dot into another dot (projecting portion).

Detailed Description Text (48):
In this manner, a pseudo half tone display can be performed in consideration of an

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increase in size of a dot in an LBP for an OA equipment which is required to prevent disconnection of a thin line, a short defect between raster scanning lines in a black painting region, or the like under the influence of various noise components or variations in parameters. Thus, problems of the conventional method can be solved, that is, an image can be prevented from being unnecessarily darkened or a shadow portion can be prevented from forming a batter.

Current US Original Classification (1):
358/3.03

☐ 61. Document ID: US 5185852 A

L5: Entry 61 of 70 File: USPT Feb 9, 1993

DOCUMENT-IDENTIFIER: US 5185852 A
** See image for Certificate of Correction **
TITLE: Antialiasing apparatus and method for computer printers

Detailed Description Text (45):
In the preferred embodiment, mapper 19 uses sampling window 45 to evaluate each pixel of bitonal bitmap 17, and generates an address therefrom in the same manner as that described in FIGS. 2b-2d. That is, mapper 19 centers sampling window 45 on a subject bitonal bitmap 17 pixel, and from the pixel values of a neighborhood subset of pixels, including the subject pixel, formulates a 5-bit address (i.e., a 4n+1 bit address depending on the size of the sampling window as discussed above). Mapper 19 applies the 5-bit address to lookup table 43 and obtains the grayscale value held at that address in the lookup table 43. From the grayscale value, mapper 19 determines a pattern of modulation needed to produce a shade of gray corresponding to the obtained grayscale value. This is accomplished by a circuit assembly described in a co-filed Patent Application entitled "Modulation Circuit For Grayscale Laser Printing", by inventor Christopher M. Mayer assigned to the assignee of the present invention and herein incorporated by reference. The circuit assembly employs a lookup table or PAL or the like to determine modulation timing and intensity parameters for the obtained grayscale value. With these parameters the circuit assembly produces gray by modulating the laser at less than full intensity. That is, due to the two dimensional gaussian distribution of energy from the laser beam, a threshold region on the OPC drum shrinks in area, and the printed dot size decreases, leaving some white space around the black dot. The printer still operates at the same initial resolution. Furthermore, the scheme is direction independent (it effects both the main scan and sub scan directions on the paper equally). Dithering techniques are used to provide intermediate shades of gray from a darker and lighter generated shade.

Current US Original Classification (1):
358/1.9

Current US Cross Reference Classification (1):
358/1.1

h e b b cg b cc e

☑ 62. Document ID: US 5182575 A

L5: Entry 62 of 70 File: USPT Jan 26, 1993

DOCUMENT-IDENTIFIER: US 5182575 A
** See image for Certificate of Correction **
TITLE: Image forming apparatus

Abstract Text (1):
This disclosure relates to an image forming apparatus in which an image is formed by deflecting a light beam a minute distance in a sub-scanning direction every pixel of image data. By controlling the emission intensity of the light beam utilizing a .gamma. correction, and by controlling the emission time of the light beam utilizing PWM control, the beam spot can be adjusted to control the dot size of the image. Accordingly, the dot density in image formation can be raised by minute deflection in the sub-scanning direction, and the reproducibility of characters and graphics is improved, particularly in the oblique direction. Furthermore, tone reproducibility of multi-tone image data is enhanced by minute deflection in the sub-scanning direction and adjustment of image dot size.

Detailed Description Text (11):
The first control operation is for changing the intensity of laser-light emission using a .gamma. correction. FIG. 7 is a block diagram showing the construction of a dot-size adjustment unit 20 for controlling the intensity of laser-light emission by a .gamma. correction. FIG. 8B is a diagram illustrating a difference in dot size due to a difference in the degree of laser-beam deflection to both sides of the sub-scanning direction. FIG. 8B is shown in exaggerated form in order to describe the difference in dot size. In actuality, the size of the recorded dots of even-numbered pixels recorded differs only slightly from the size of the recorded dots of odd-numbered pixels. Assuming that the odd-numbered pixels are deflected upwardly relative to the sub-scanning direction and the even-numbered pixels downwardly relative to the sub-scanning direction, in effect a two-line image is formed from a single line of an inputted image signal. Accordingly, with regard to the dot array that forms the image, odd-numbered pixels can be considered to form odd-numbered lines and even-numbered pixels can be considered to form even-numbered lines, counting from a certain reference line. FIG. 8B shows an example in which the dot size of even-numbered lines formed from even-numbered pixels is smaller than the dot size of odd-numbered lines formed from odd-numbered pixels.

Current US Cross Reference Classification (1):
358/296

☐ 63. Document ID: US 5146548 A

L5: Entry 63 of 70 File: USPT Sep 8, 1992

DOCUMENT-IDENTIFIER: US 5146548 A
TITLE: Method and apparatus for optimizing and storing contone images for subsequent half-toning and merging with text

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Current US Original Classification (1):
358/1.18

Current US Cross Reference Classification (1):
358/1.16

Current US Cross Reference Classification (2):
358/3.14

Current US Cross Reference Classification (3):
358/3.24

Current US Cross Reference Classification (4):
358/403

Current US Cross Reference Classification (5):
358/461

CLAIMS:

19. A process for producing a printed article comprising the following steps:

(a) digitizing an image to thereby provide a contone data set representing said image;

(b) enhancing said contone data set to provide an enhanced contone data set;

(c) storing said enhanced contone data set within an image database, including the step of associating said stored data set with a unique designator;

(d) repeating said steps (a)-(c) to provide said image database of stored enhanced contone data sets having designators associated therewith;

(e) providing a plurality of blocks of textual information and associated designators;

(f) retrieving and merging said stored enhanced contone data sets with said blocks of textual information, including the step of matching designators corresponding to said blocks of textual information with designators associated with said stored data sets;

(g) converting said merged textual information blocks and data sets into half-tone representations; and

(h) rendering said half-tone representations on printing media,

wherein at least one of said converting step (g) and said rendering step (h) includes the step of affecting print quality in response to a print quality factor, and said enhancing step (b) includes the step of optimizing said enhanced contone data set beforehand in response to said print quality factor, and

wherein said affecting step includes the step of increasing the size of half-tone dots beyond nominal half-tone dot sizes, and said optimizing step includes the step of shifting pixel levels within said enhanced contone data set so as to compensate for said half-tone dot size increase.

21. A process for preparing multiple listing service books including the following steps:

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photographing an image of a real estate property offered for sale;

inputting textual information relating to said real estate property into a multiple listing service data processing system;

assigning a multiple listing number to said real estate property;

digitizing said photographed image to thereby provide a contone data set representing said image;

enhancing said contone data set to provide an enhanced contone data set;

inputting said assigned multiple listing number;

storing said enhanced contone data set in association with said inputted multiple listing number;

obtaining said inputted textual information and associated multiple listing number from said multiple listing service data processing system;

retrieving said stored enhanced contone data set in response to said multiple listing number;

merging said stored enhanced contone data set with said obtained textual information and converting said merged data set and textual information into half-tone representations; and

rendering said half-tone representations on printing media, wherein at least one of said converting step and said rendering step includes the step of affecting print quality in response to a print quality factor, and said enhancing step includes the step of optimizing said enhanced contone data set beforehand in response to said print quality factor by shifting pixel levels within said enhanced contone data set so as to compensate for half-tone dot size increase.

☐ 64. Document ID: US 5113456 A

L5: Entry 64 of 70 File: USPT May 12, 1992

DOCUMENT-IDENTIFIER: US 5113456 A
TITLE: Method of and apparatus for recording image

Detailed Description Text (34):
Accordingly, the sharpness processor 72 generates an unsharp signal based on the image signals obtained from an area twice larger in the main and auxiliary scanning directions, and then processes the image signals for sharpness enhancement according to the equation (1). Then, the processed image signals are supplied to the halftone dot image generator 74. The sharpness processor 72 effects substantially the same sharpness enhancing process as if the image signals were processed for sharpness enhancement based on (2n .times. 2n) pixels. Inasmuch as the halftone dot image generator 74 effects a halftone dot process on the image signals which have been processed for sharpness enhancement based on wider-range

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image information, appropriate on-off signals which will not lessen the desired sharpness of the image can be supplied from the halftone dot image generator 74 to the driver 28 even when the halftone dot size is increased.

Current US Original Classification (1):
382/266

Current US Cross Reference Classification (1):
358/448

Full | Title | Citation | Front | Review | Classification | Date | Reference | [illegible] | Claims | KWIC | Draw De

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☑ 65. Document ID: US 5029108 A

L5: Entry 65 of 70 File: USPT Jul 2, 1991

DOCUMENT-IDENTIFIER: US 5029108 A
TITLE: Edge enhancement method and apparatus for dot matrix devices

Detailed Description Text (6):
In accordance with the present invention, the jagged edge in FIG. 2a is adjusted by the insertion or substitution of various smaller dot sizes 122 to smooth the edge. The dotted lines 120 in FIG. 2b indicate where a full dot in FIG. 2a is now shrunk to a smaller size dot 122, and a 30% dot 124 is added to pad the area which normally would not have been an ON pixel. As illustrated at 126, the adjustable dot size of the present invention can vary from 1/2 to 1/32 of a full dot. By varying the dot size to enhance edges, as indicated at 128, a smoother edge representation can be achieved.

Current US Original Classification (1):
358/1.9

Full | Title | Citation | Front | Review | Classification | Date | Reference | [illegible] | Claims | KWIC | Draw De

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☐ 66. Document ID: US 5005139 A

L5: Entry 66 of 70 File: USPT Apr 2, 1991

DOCUMENT-IDENTIFIER: US 5005139 A
TITLE: Piece-wise print image enhancement for dot matrix printers

Brief Summary Text (6):
Distortion in bit map representations is a consequence of low resolution of the bit map or low sampling rates of the desired analog image. A typical approach to reducing this distortion has been to increase the resolution of the bit map image by increasing the number of dots in a fixed size image, i.e., reducing the dot size, which increases the spatial resolution. Increasing the resolution reduces the size of the step distortions as well as preserving much fine detail which is lost at lower resolution. However, increasing the resolution is expensive. The amount of

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data to be processed and stored is proportional to the number of pixels or cells in the bit map. For example, doubling the resolution of a 300 by 300 dpi two-dimensional bit map results in a 600 by 600 dpi bit map which requires 4 times more memory and processing power. Further, a bit map image output device, cathode ray tube (CRT) or printer, for example, capable of displaying this higher resolution image must be used which may further increase the cost. If it is required to enhance the resolution on intensity level or colors as well, the cost will be further increased. While this solution has been used in many more sophisticated, high end printers, it is not a practical solution for lower cost, low end printers.

Current US Original Classification (1):
358/1.1

Current US Cross Reference Classification (1):
382/254

☐ 67. Document ID: US 4985779 A

L5: Entry 67 of 70 File: USPT Jan 15, 1991

DOCUMENT-IDENTIFIER: US 4985779 A
TITLE: Improved method and apparatus for generating halftone images

Brief Summary Text (18):
Furthermore, as every exposure dot decision is made according to the result of a greater-smaller comparison between the picture intensity and the screen function R=f(x,y), the dot shape for a given picture intensity value at a certain location of the film can differ, from the screen dot shape for the next picture intensity value at the same location, only by the addition of zero or more exposure dots to the smaller screen dot. These considerations impose limitations on the possible kinds of functions R=f(x,y) that can be used in systems of this type. One requirement is that the function be single-valued. Typically screen dot size is a monotonically increasing function of picture intensity. One system, restricted to the generation of hard dots, that attempts to avoid these limitations is disclosed in U.S. Pat. No. 4,825,298. In that system, there is superimposed an additional set of constraints, which may be implemented in a lookup table, on the binary on-off decision for each exposure dot.

Current US Original Classification (1):
358/3.1

Current US Cross Reference Classification (2):
358/3.2

Current US Cross Reference Classification (3):
358/3.23

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☐ 68. Document ID: US 4977458 A

L5: Entry 68 of 70 File: USPT Dec 11, 1990

DOCUMENT-IDENTIFIER: US 4977458 A
** See image for Certificate of Correction **
TITLE: Apparatus for addressing a font to suppress Moire patterns occurring thereby and a method for use therein

Brief Summary Text (9):
Unfortunately, modern printing presses do not possess the capability of applying differential amounts of ink to any location in an image. Rather, these presses are only designed to either apply or not apply a single amount of ink to any given location. Therefore, a printing press is unable to directly print a contone separation. To successfully circumvent this problem, halftone separations are used instead. An image formed from halftone separations encodes the color information inherent in a color image from amplitude modulated form into a spatial (area) modulated form, in terms of dot size, which is subsequently converted by the human eye into a desired color. Specifically, it has been known in the art for quite some time that, for black and white images, a number of small black dots of a corresponding size, when printed over an area and later viewed at a distance, will be spatially integrated by a human eye into an intermediate shade of grey. The size of the dot can be varied from 100%, i.e. a full dot, through 50%, a half dot, to 0% (at which no dot is printed) to yield the color black, gray or white. Hence, by smoothly changing dot sizes (areas), smooth corresponding tonal variations will be generated in the reproduced image. Given this, the art has taught for some time that a full color image can be formed by properly overlaying single color halftone reproductions for all of the primary subtractive colors, where each reproduction is formed from a halftone dot separation that contains dots of appropriate sizes and in one of these primary colors. Clearly, as size of the dots decreases, an increasing amount of detail can be encoded in a dot pattern and hence in the reproduced image. For that reason, in graphic arts applications, a halftone separation utilizes very small dots to yield a dot pitch (resolution) ranging from 85 to as much as 200 dots/inch (approximately 33 to 79 dots/centimeter).

Current US Original Classification (1):
358/3.26

Current US Cross Reference Classification (1):
358/524

☐ 69. Document ID: US 4916545 A

L5: Entry 69 of 70 File: USPT Apr 10, 1990

DOCUMENT-IDENTIFIER: US 4916545 A
TITLE: Electronic graphic arts screener that suppresses Moire patterns using pseudo-random font selection

Brief Summary Text (9):

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Unfortunately, modern printing presses do not possess the capability of applying differential amounts of ink to any location in an image. Rather, these presses are only designed to either apply or not apply a single amount of ink to any given location. Therefore, a printing press is unable to directly print a contone separation. To successfully circumvent this problem, halftone separations are used instead. An image formed from halftone separations encodes the color information inherent in a color image from amplitude modulated form into a spatial (area) modulated form, in terms of dot size, which is subsequently converted by the human eye into a desired color. Specifically, it has been known in the art for quite some time that, for black and white images, a number of small black dots of a corresponding size, when printed over an area and later viewed at a distance, will be spatially integrated by a human eye into an intermediate shade of grey. The size of the dot can be varied from 100%, i.e. a full dot, through 50%, a half dot, to 0% (at which no dot is printed) to yield the color black, gray or white. Hence, by smoothly changing dot sizes (areas), smooth corresponding tonal variations will be generated in the reproduced image. Given this, the art has taught for some time that a full color image can be formed by properly overlaying single color halftone reproductions for all of the primary subtractive colors, where each reproduction is formed from a halftone dot separation that contains dots of appropriate sizes and in one of these primary colors. Clearly, as size of the dots decreases, an increasing amount of detail can be encoded in a dot pattern and hence in the reproduced image. For that reason, in graphic arts applications, a halftone separation utilizes very small dots to yield a dot pitch (resolution) ranging from 85 to as much as 200 dots/inch (approximately 33 to 79 dots/centimeter).

Current US Original Classification (1):
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Current US Cross Reference Classification (2):
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DOCUMENT-IDENTIFIER: US 4115788 A
TITLE: Compound matrix formation in an ink jet system printer

Brief Summary Text (4):
To minimize the above defects, it has been proposed to increase the necessary number of dots constituting a dot matrix pattern to thereby reduce the spacing between two adjacent dots in the dot matrix pattern. However, the printing velocity becomes slow as the dot number required in the dot matrix pattern increases, or the dot size becomes unavoidably small as the dot number required in the dot matrix pattern increases, which also damages the visibility of the printed character. Moreover, even when the dot number required in the dot matrix pattern is increased, the distance between two adjacent dots along oblique lines in the dot matrix pattern is still longer than the distance between two adjacent dots along the lateral or vertical line in the dot matrix pattern.

h e b b cg b cc e

Current US Cross Reference Classification (2):
358/1.8

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Term	Documents
(4 AND 1).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	70
(L4 AND L1).PGPB,USPT,EPAB,JPAB,DWPI,TDBD.	70

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